

GLOBAL MARKET SURVEY

METALWORKING AND FINISHING EQUIPMENT



U.S. DEPARTMENT OF COMMERCE/ Domestic and International Business Administration

This Global Market Survey is one in a series of Bureau of International Commerce Publications focusing on overseas marketing opportunities for U.S. suppliers in selected industries. These Surveys are prepared by the Bureau's Office of International Marketing in cooperation with the Department of State's U.S. Foreign Service and are based on research conducted in key foreign markets.

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METALWORKING AND FINISHING EQUIPMENT



U.S. DEPARTMENT OF COMMERCE

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Preface

This Global Market Survey is intended to serve as an export sales planning tool for marketing decision makers of American companies engaged in the manufacture of metalworking and finishing equipment. It is a ready desk reference of facts and figures on the country markets researched and identifies the best U.S. export sales opportunities in each market on a product-by-product basis.

Experienced international trade specialists at the Department of Commerce in Washington or at the Department's 42 district offices are prepared to work with each firm in the development of an international marketing plan tailored to its own business needs and export capabilities. This is an important phase of a continuing Commerce Department export expansion program designed to help American manufacturers enter overseas markets if they are not presently engaged in export trade or, if they are already exporting, to help them increase their share of current markets and to make inroads into new markets. Given the evidence of rapidly expanding overseas markets for metalworking and finishing equipment, U.S. manufacturers are urged to take advantage of the Department's numerous export expansion programs and services aimed at helping them capitalize on the export growth potentials described in this Survey.

U.S. products and industries featured in Global Market Surveys are selected because of their technological or other competitive advantages in the world marketplace. Global Market Surveys published in 1973 and 1974 include:

- Agricultural Machinery and Equipment (1973)
- Micrographics Equipment and Supplies (1973)
- Biomedical Equipment (1973)
- Computers and Related Equipment (1973)
- Materials Handling Equipment (1974)
- Electronics Industry Production and Test Equipment (1974)
- Printing and Graphic Arts Equipment (1974)
- Electronic Components (1974)
- Metalworking and Finishing Equipment (1974)

For additional information on any of the above Global Market Surveys or any of the U.S. Department of Commerce export expansion programs and services, contact the Department's District Office nearest you (list on page 210).

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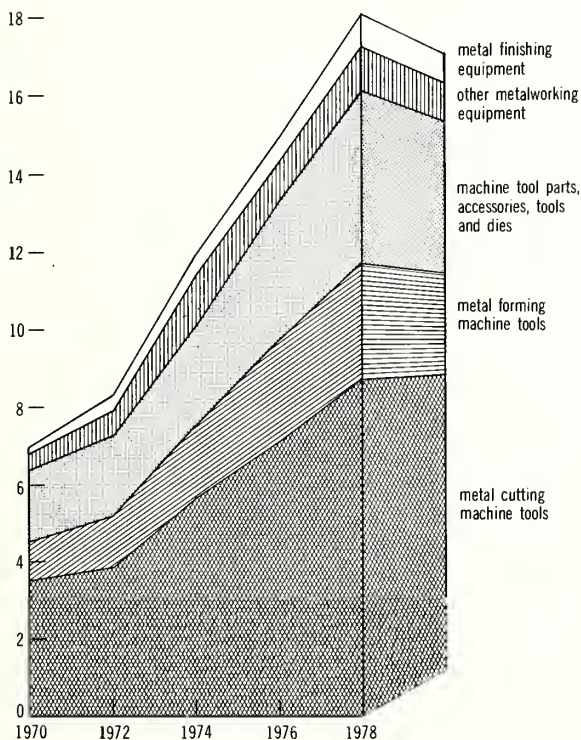
A Summary of World Markets For Metalworking and Finishing Equipment

Consumption of metalworking and finishing equipment in 17 of the foreign markets surveyed is projected to exceed \$18 billion in 1978, an increase of 53% over the estimated market of \$11.9 billion in 1974 (see table 1). Sales in these same countries totaled \$8.3 billion in 1972. This amount represented over 85% of all metalworking and finishing equipment consumed outside the United States and over 75% of the global market.

The market for metalcutting machine tools in the 17 countries increased significantly from \$3.8 billion in 1972 to an estimated \$5.6 billion in 1974. Increased demand should boost sales to approxi-

Consumption of Metalworking and Finishing Equipment¹ in 17 countries, 1970-78, Alternate Years

(billions U.S. dollars)



¹ See Table 1 for country details. Dollar values for years 1970 and 1972 based on current exchange rates; for years 1974-78 dollar values based on 1973 exchange rates.

Source: U.S. Department of Commerce market research studies.

mately \$8.6 billion in 1978. Consumption of metal forming machine tools stood at \$1.4 billion in 1972, reached an estimated \$1.9 billion in 1974, and should climb to \$3.2 billion in 1978. The machine tool parts, accessories and tools and dies market increased from the \$2.2 billion recorded in 1972 to approximately \$3.1 billion in 1974. Consumption should be in the neighborhood of \$4 billion in 1978. Lack of data on metal finishing equipment in some countries precludes discussion of aggregate market size for such machinery. Indications are, however, that the needs for such machinery will continue to grow as overseas metalworking industries become increasingly sophisticated.

While demand for metalworking and finishing equipment in the United States continues to be strong, many American manufacturers are becoming increasingly conscious of opportunities in foreign markets.

Net new orders from overseas and shipments to foreign markets have increased steadily in recent years. Machine tool orders from abroad in 1972 amounted to \$167 million, or 11.8% of total new orders.¹ New orders received from overseas in 1973 equaled \$345 million, or 13.2% of the total. It was estimated that approximately 13.7% of orders placed in 1974 would come from foreign buyers.

The United States in 1972 supplied \$3.2 million of metalworking and finishing equipment to the 22 countries researched in this Global Market Survey (see graph 2). Trade sources within the countries anticipate that the overseas market should approximate \$1 billion in 1978.

Among the country markets covered within this Survey are those which can be classified as traditional to U.S. suppliers, since they have consistently

Unless otherwise noted, the machinery encompassed in this Global Market Survey under the category "Metalworking and finishing equipment" includes: machine tools for working metals, both metal cutting and metal forming types; parts and accessories, and tools and dies for machine tools; and metal parts cleaning and finishing equipment for the metalworking industries.

¹ NMTBA, 1974-75 *Economic Handbook of the Machine Tool Industry*.

² NMTBA; based on 7 month data for 1974.

Table 1.—Consumption of metalworking and finishing equipment, by country,¹ 1972, 1974, and 1978
(in millions of U.S. dollars)

	1972	1974	1978
Austria	92.9	131.0	171.0
Australia ²	114.7	165.2	194.5
Brazil	197.0	399.6	1,295.6
France ²	777.6	1,214.0	1,791.0
Germany ²	1,327.0	1,882.0	2,210.0
India	152.0	197.0	347.5
Israel	66.4	83.5	106.0
Japan	1,635.7	2,463.3	4,091.2
Korea	27.1	38.2	80.9
Mexico	90.2	97.3	138.0
Poland	314.0	418.0	613.0
Spain ²	142.1	200.0	273.6
Sweden ²	124.9	167.6	210.0
Switzerland ²	92.2	118.5	165.0
Taiwan ²	22.9	38.0	67.0
U.K. ³	359.4	454.2	443.2
U.S.S.R.	2,717.0	3,871.0	5,964.0
TOTAL	8,253.1	11,938.4	18,161.5

¹ Comparable consumption data not available for Iran, Italy, People's Republic of China, Philippines and Portugal.

² Includes metalworking equipment only.

³ Excludes tools and dies, other metalworking equipment, and metal finishing equipment.

Source: U.S. Department of Commerce, Bureau of International Commerce market research studies.

been large consumers and importers of metalworking and finishing equipment. Included within this grouping are West Germany, the Soviet Union and France. These countries will continue to offer numerous sales opportunities to American manufacturers throughout the remainder of the decade.

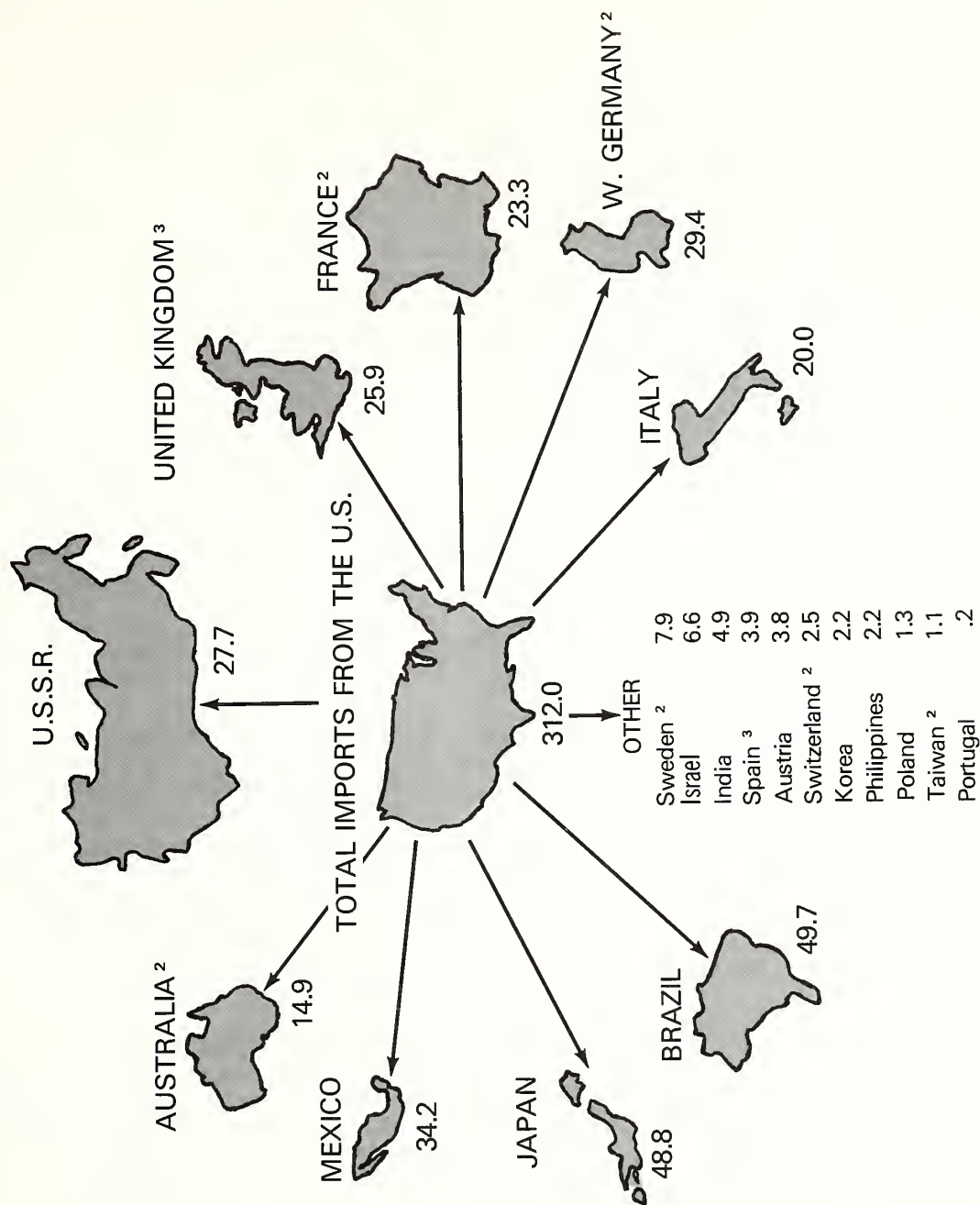
Germany—In spite of a high level of production, imports supply a significant portion of the large metalworking equipment market. Metalworking equipment purchases abroad in 1974 by German industry are placed at \$417 million, or 22% of consumption, and are projected to reach \$575 million, or 26% of the market, in 1978. U.S. machine tool sales to Germany were valued at more than \$29 million in 1972 and will reach in excess of \$60 million in 1978 if U.S. suppliers hold the 11% market share they recorded in the earlier year. Although it is presently undergoing a period of readjustment, the German motor vehicle industry is anticipated to remain the largest purchaser of metalworking and finishing equipment. The industry invested approximately \$600 million in such equipment in 1974. This was far above the figure for the electrical equipment and appliance industry, which ranked second with purchases amounting to roughly \$105 million. The United States is Germany's principal foreign supplier of metal forming machine tools; however, trade sources believe that the metal cutting machine tool market is underrated by U.S. producers and may provide excellent opportunities for expanding U.S. sales.

Union of Soviet Socialist Republics—Expanding U.S.-Soviet trade relations have resulted in increasing sales by U.S. suppliers in the large and growing Soviet metalworking and finishing equipment market, which is projected at perhaps \$6 billion in 1978. U.S. sales in 1972 totaled \$27.7 million (based on U.S. export statistics); sales approximately doubled in 1973 and are expected to exceed \$150 million in 1978. This would represent an average annual rate of increase in U.S. sales of nearly 35% over the six-year period, as compared to a projected 46% average annual rate of increase in total imports and a 27% average annual growth rate projected for consumption of metal working and finishing equipment as a whole for the same period. The U.S.S.R. Ninth Five Year Plan (1971-75) has placed a high priority on growth in the industrial sector, and high levels of capital investment have been effected or are planned. To reach the production target of 2.1 million vehicles annually in 1975, increasing levels of capital expenditure have been earmarked for the motor vehicle industry. Expenditures approximated \$3 billion in 1974. Future projects now in the development stage include new projection facilities for heavy trucks, motorcycles, and automobile engines, as well as rehabilitation and expansion of several existing plants. Other priority industry sectors targeted for high levels of investment are tractors and agricultural implements, machine tools, power generating equipment, and transport equipment (other than motor vehicles).

France—As one of the largest users of metalworking and finishing equipment in the world, France is expected to consume about \$1.8 billion of metalworking equipment in 1978. Consumption of metalworking equipment is anticipated to increase by over 10% annually during the 1974-78 period as local end-users, chiefly the motor vehicles, electric and electronic, and aerospace industries, gear up for anticipated demand. Imports, which supplied over 40% of domestic metalworking equipment needs in 1972, came primarily from European sources. Imports from the United States amounted to \$23 million in that year and are expected to almost double by 1976, reaching \$42 million. While competition likely will remain strong in this decade, American manufacturers should be able to significantly increase their total sales volume with an active sales campaign and prompt and efficient service.

Research received from abroad has indicated there are several markets (Brazil, Korea and the Republic of China on Taiwan, among others) which are anticipated to expand at impressive rates during the 1975-78 period. U.S. suppliers stand to substantially

**Graph 2—Imports of metalworking end finishing equipment
from the U.S. by 21 countries,¹ 1972**
(in millions of U.S. dollars)



¹ No imports from the U.S. by the People's Republic of China were recorded.

² Metalworking equipment only.

³ Excludes tools and dies, other metalworking equipment and metal finishing equipment.

Source: U.S. Department of Commerce, Bureau of International Commerce market research studies.

increase their sales in each of the markets during the remainder of the 1970's.

Brazil—Industry output in Brazil has been growing at a rate of over 10% annually for the last 6 years. The motor vehicle industry, one of the largest end-users of metalworking and finishing equipment, increased production by 19% in 1973, recording sales of 730,000 vehicles. Capital investment in the industry is anticipated to reach \$1.2 billion in 1978 and the industry is expected to reach its goal of 2 million vehicles by 1980.

Plant expansion and retooling seem inevitable in most industries, and local trade sources estimate this will result in an increase in metalworking and finishing equipment purchases of approximately 35% per year during the 1974-78 period. Domestic production of metalworking equipment will not be able to keep pace with rapidly increasing market demands despite expected improvements in the industry's structure and technology. Consequently imports are projected to supply approximately 90% of consumption in 1978.

The United States, by far the leading foreign supplier of metalworking and finishing equipment to Brazil in 1972, should maintain its 35% share of the import market through 1978. This means aggregate imports of metal working and finishing equipment from the United States are likely to exceed \$1 billion over the 1975-78 period.

Korea—High levels of investment in new equipment to implement an intensive heavy industry development program are spurring this fast growing market for metalworking and finishing equipment. Projects for development of the shipbuilding, iron and steel, automobile, and industrial machinery manufacturing industries are expected to more than double the market from 1974 to 1978, with consumption projected to reach in excess of \$80 million in the latter year. An active approach to the Korean market should permit U.S. exporters to benefit from Korean interest in diversifying sources of supply. Trade sources believe that U.S. sales of metalworking and finishing equipment to Korea could reach \$10 million in 1976, representing a 22% share of the approximately \$45 million in imports projected for that year, and more than doubling the 10% share of the import market held by American suppliers in 1972.

The Republic of China on Taiwan—Gross national product (GNP) on the island increased over 22% in real terms during 1973. The recent establishment of such industries as food processing and large injections of capital into others, including the shipbuilding industry, are expected to contribute greatly to local demand for metalworking and finishing equipment. Consumption of metalwork-

ing and finishing equipment is anticipated to grow 15% annually during the 1974-78 period. The U.S. share of imports should increase significantly due to restrictions on trade with Japan, and the country's increasing dependence on labor saving equipment as wage rates continue to climb.

This Global Market Survey also covers a number of developing markets which merit the attention of U.S. suppliers of metalworking and finishing equipment. Such markets as the People's Republic of China, Poland and India are expected to prove to be particularly significant to U.S. exporters during the remainder of the decade.

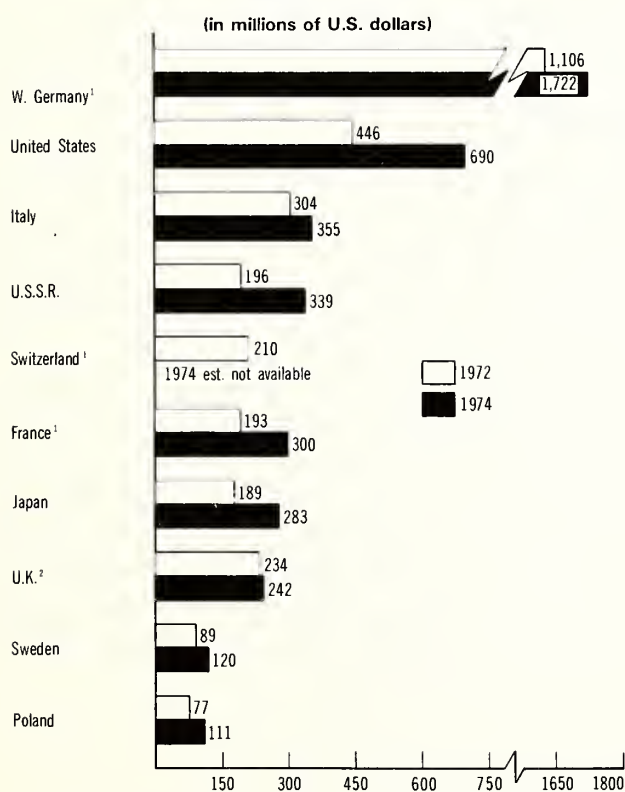
People's Republic of China—The mainland Chinese are giving increased priority to industrial expansion in their current economic planning and have indicated increasing willingness to import advanced Western products and technology to spur development of priority industries. The People's Republic imported over \$19 million of metalworking and finishing equipment from major Western suppliers in 1973 and are expected to increase their foreign purchases during the 1974-78 period. While a wide range of general purpose machine tools is produced locally, mainland China looks to Western sources to fill its requirements for high precision and special purpose machine tools; large scale, heavy-duty machine tools; and advanced equipment and technology. The motor vehicle, power generating equipment, metallurgical equipment, machine tools, and agricultural equipment industries are the principal potential end-users. An \$8.2-million sale of automotive gear and axle production machinery by a U.S. firm in early 1974 is indicative of the high potential for American metalworking and finishing equipment exports to the PRC.

Poland—Already ranked number two in Eastern Europe in industrial production, population, and area, Poland is now striving to raise the standard of living of its people. To keep industrial activity increasing at a fast pace, economic plans call for establishment of a number of new plants with a heavy reliance on foreign equipment and technology. For example, capital investments of some \$600 million are earmarked for the automotive industry in the 1975-78 period, while the heavy electrical equipment and supplies manufacturing sector will receive substantial investment allocations to support rural electrification projects and general expansion of electrical power grids. The market for metalworking and finishing equipment is projected to exceed \$600 million in 1978, of which over \$360 million is expected to represent imports. U.S. sales of metalworking and finishing equipment to Poland totaled \$1.3 million in 1972, but this was only a beginning. Polish buyers are

expected to look increasingly to the United States to supply the sophisticated and specialized equipment for which demand is growing. U.S. sales in 1976 are projected at \$22 million—a market share of 7.5%.

India—Reflecting development of the major industrial sectors, the Indian market for metalworking and finishing equipment exceeded \$150 million in 1972. Planned developments during the 1974-78 period in the machine tool, heavy electrical equipment, heavy motor vehicles, and heavy engineering industries will call for capital investments in excess of \$400 million. In 1972, India imported close to \$50 million of metalworking and finishing equipment, approximately 10% of which came from the United States. Although much of India's imports are associated with bilateral "cooperating agreements" with socialist countries, the United States is expected to supply over 15% of the import market in 1976, due to the rising demand for advanced machinery, and accessories, tools and dies.

Graph 3—Exports of metalworking and finishing equipment by major exporting countries, 1972 and 1974.



¹ Data on metalworking equipment only.

² Data excludes tools and dies, other metalworking equipment and metal finishing equipment.

Source: U.S. Department of Commerce, Bureau of International Commerce market research studies; U.S. Bureau of Census, FT 410; Bureau of International Commerce estimates.

Best Sales Opportunities

Market researchers were asked to identify and rank the 15 categories of metalworking and finishing equipment believed to have the best sales potential for U.S. suppliers during the 1974-78 period in each target market. Selections were based on comparison of trade and market data, both historical and projected, and the results of trade source interviews and industry polling. The researchers were asked to discuss consumption and import trends of the five leading categories and to comment on the competitive position of U.S. equipment, including descriptions of domestic manufacturers and foreign competitors in the target market. A list of specific U.S. items of equipment expected to sell well during the period also was requested.

Collation of the best sales opportunities in the 16 Country Market Surveys and 6 Country Market Briefs indicated that, in the aggregate, the following categories of metalworking and finishing equipment offer the greatest potential sales for U.S. firms. (There may be other items which have been identified in specific country markets which also have good sales potential based on unique requirements within the specific market.)

METAL CUTTING MACHINE TOOLS

Numerically controlled (NC) metal cutting machine tools, all types

Gear cutting and finishing machines

Cylindrical grinding machines

Special purpose grinding machines

Bed type milling machines, horizontal, and vertical

Knee and column milling machines, horizontal, vertical and universal

Special purpose milling machines

Turning machines, automatics, engine lathes, turret lathes, and special purpose lathes

NC machining centers

METAL FORMING MACHINE TOOLS

Multiple action hydraulic presses

Automatic mechanical presses

Special purpose hydraulic and mechanical presses

NC hydraulic and mechanical presses

NC bending and forming machines

NC punching and shearing machines

ACCESSORIES, ATTACHMENTS AND AUXILIARY EQUIPMENT FOR MACHINE TOOLS

TOOLS FOR MACHINE TOOLS

U.S. Competitive Position

Exports of metalworking and finishing equipment historically have played an important role in the U.S. balance of trade; the trade balance with regard to MFE has consistently been in the black for the last 20 years. More importantly, however, overseas metalworking equipment markets have been of major significance to the U.S. machine tool industry, not only as a bona fide market but as a "cushion" in years

when the domestic market declined. During 1967-70, when shipments decreased from \$1.8 billion to \$1.5 billion, exports rose from \$232 million to \$297 million (see table 2). Domestic manufacturers have been paying greater attention to foreign demands since 1970, with the result that metalworking equipment exports averaged 21% of total shipments. The overseas market proved to be particularly lucrative in 1973 and 1974 as exports climbed to \$326 million and an estimated \$370 million, respectively.

The trend toward increasing exports does not, however, imply that foreign manufacturers are becoming any less competitive. To the contrary, foreign competition is becoming increasingly keen. Approximately 40% of the more than 750 exhibitors at the 1974 International Machine Tool Show held in Chicago represented manufacturers of foreign equipment. A number of the exhibits rivaled American technology; EDM and ECM machinery from Switzerland and France, NC controls and equipment from Germany and Japan, and turning machines from the U.K., Japan and Germany were but a few examples.

Germany, which exported \$1.1 billion of metalworking equipment in 1972, is leading and likely will continue to lead the world in exports of such machinery (see graph 3). Italy, Switzerland, France, Japan, and the United Kingdom are also significant competitors in the world market. Production in the U.S.S.R. and Poland currently centers around traditional pieces of machinery yet, to the extent that they are able to develop the necessary technology,

these nations will become increasingly competitive with U.S. suppliers.

Without exception, the major competitors to the United States rely heavily upon export earnings to maintain their economic viability. As such, they are familiar with foreign market demands and marketing techniques. For example, most competitors maintain overseas servicing facilities, keep in frequent contact with potential purchasers, and mount effective advertising campaigns. U.S. suppliers of metalworking and finishing equipment should be sensitive to these same needs in developing foreign markets.

While foreign customers are generally familiar with U.S. machinery, they suggest that many American companies could secure additional new business abroad by establishing sales goals for individual export markets and allocating appropriate company resources towards the achievement of such goals. Some companies, recognizing this, have adopted bold commitments to maximize their participation in the large international market and to secure as much as 50% of their sales from abroad. The following basic steps are suggested for consideration by firms seeking to initiate penetration in foreign markets:

- Establish effective sales representation abroad
- Participate in overseas trade exhibitions
- Provide for sales and technical literature written in appropriate languages
- Advertise in appropriate trade publications and contribute articles to appropriate trade journals
- Maintain delivery commitments and effective after-sale service

The Department of Commerce stands ready to assist U.S. metalworking and finishing equipment firms in capturing a greater share of the overseas market. Export information services supplied by the Department are listed and explained on page 203. Companies interested in obtaining more information on the listed programs should contact the nearest Department of Commerce District Office.

In summary, the overseas MFE market, projected to exceed \$18 billion in 1978, offers substantial opportunities for U.S. businessmen, both those heretofore unfamiliar with overseas marketing and those presently involved overseas, to broaden their marketing base and reap additional sales. While gaining entry into overseas markets may necessitate a considerable investment in terms of time, effort and capital, like most well-chosen investments, the benefits more often than not will prove rewarding.

Table 2.—U.S. shipments and exports of machine tools,¹ 1967-74
(in millions of dollars)

	shipments	% increase (decrease)	exports	% increase (decrease)	% of exports to shipments
1967	1,826		232		12.7
1968	1,720	(5.8)	222	(4.3)	12.9
1969	1,693	(1.6)	248	11.7	14.6
1970	1,552	(8.3)	297	19.8	19.1
1971	1,058	(31.8)	258	(13.1)	24.4
1972	1,169	10.5	238	(7.8)	20.4
1973	1,570	34.3	326	37	20.8
1974 (est.)	1,875	19.4	370	13.5	19.7

¹ SIC Codes 3541 and 3542 only.

Source: U.S. Industrial Outlook 1975, U.S. Department of Commerce, 1974.

Country Market Surveys

Surveys on 16 primary country markets for metalworking and finishing equipment are contained in this section. These surveys are based on comprehensive market studies conducted for the U.S. Department of Commerce in the respective countries. The products covered in the *Country Market Surveys* are, for the most part, divided into the following six subcategories:

- Metal cutting machine tools
- Metal forming machine tools
- Parts and accessories for machine tools
- Tools and dies
- Other metalworking equipment
- Metal finishing equipment

Due to a lack of statistical information on metal finishing equipment in some of the countries surveyed, discussion of the market in those particular *Country Market Surveys* is limited to metalworking equipment.

Each *Country Market Survey* includes:

Market Size

- Narrative and statistical presentation—historical and projected—of consumption and imports of the product category, and the competitive position of U.S. equipment.

Sales Opportunities

- Identification and discussion of specific items within the product category which are expected to offer high sales potential for U.S. suppliers.

End-User Industries

- Brief discussion and statistical presentation of local end-user industries.
- Narrative and statistical presentation of principal sectors within industry groupings considered to be major users of metalworking and finishing equipment.
- Profile of the five major industry sectors utilizing metalworking and finishing equipment, including discussion of capital investment trends, expansion plans, and listing of products which hold attractive sales potential for U.S. manufacturers.

Domestic Manufacture of Metalworking and Finishing Equipment

- Discussion of annual production and exports—historical and projected—of the domestic metalworking and finishing equipment manufacturing industry.
- Type and sophistication of local manufacture.
- Names of important local producers.

Trade Regulations

- Discussion of duty rates and non-tariff trade barriers.
- Discussion of channels of distribution.
- Discussion of customary practices for installation of equipment, service and maintenance contracts, etc.

Technical Requirements

- Electrical power supply characteristics.
- Systems of weights and measures.
- Technical standards and requirements, where applicable.

Australia

Australia embarked on a period of economic expansion in 1973, marking its recovery from a mild 2-year recession. Rapidly rising domestic sales of consumer durables and strong export demand for the country's minerals and agricultural products are estimated to have boosted the rate of economic growth to 7%, in real terms, during 1974¹ and annual increases in Australia's gross national product are projected to average 6% through 1978.

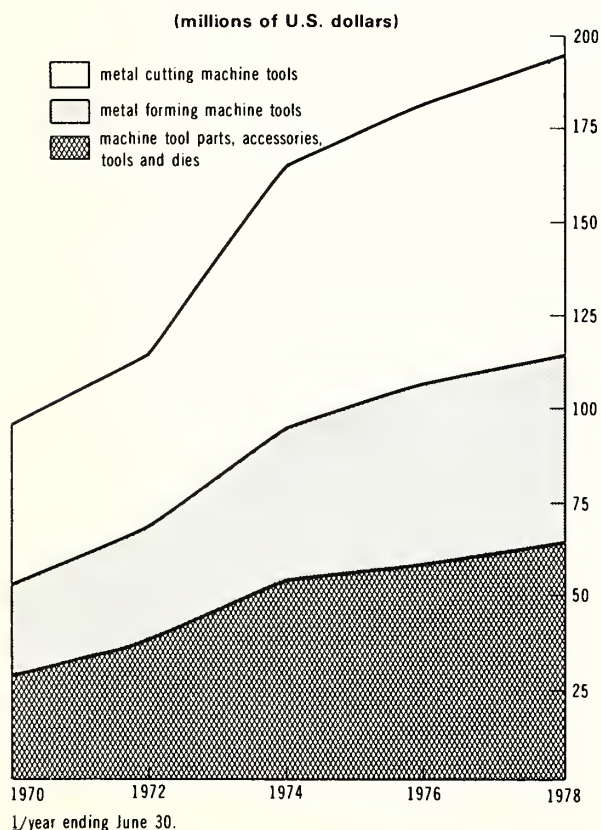
Soaring profits are enabling Australian manufacturers to carry out capital spending plans that were postponed in 1971 and 1972, when the economic outlook was less favorable. Many production facilities are operating at or near capacity and capital expenditures rose by an estimated 10% in 1974. Private sector spending on plant and equipment should reach a peak annual growth rate of 22% by 1978.

Led by manufacturers of major home appliances, motor vehicles, and primary metal products, Australia's users of metalworking and finishing equipment (MFE) are expected to boost their outlays for this equipment by an average of almost 5%² per year between 1974 and 1978. The volume of new orders placed with both domestic MFE manufacturers and importers appears to support this forecast. Consumption in 1978 could approach \$200 million, a major increase over 1974's estimated market of \$165 million (see table 1).

It has been estimated that Australian industry purchased \$68.8 million worth of metal cutting machine tools in 1974, nearly 50% more than the \$47.8 million expended for such equipment in 1972. This segment of the market is expected to expand by 4.2% per year, exceeding \$80 million in 1978. Consumption of metal forming machine tools was an estimated \$43 million for 1974 and should reach \$50 million in 1978.

Parts, accessories, and tools and dies for machine tools continue to account for a substantial portion of the total market for metalworking equipment.

Australia.--Consumption of metalworking equipment, 1970-78, alternate years.^{1/}



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Australian official trade statistics and trade source estimates.

¹ Australian statistics are based on a July-June fiscal year: thus all statistical figures in this discussion are presented on a fiscal year basis.

² In order to present a more accurate picture, growth rates have been calculated from the local currency values. This method eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	A\$/US\$1
1968-72	0.84
1973-78	0.67

Purchases of such items approached \$40 million in 1972 and were seen to exceed \$53 million in 1974. This segment of the market could be worth more than \$60 million by 1978. Although there is a market for metal finishing equipment, statistical information on this category is not available.

Australian industry imported almost 70%, or \$114 million, of its 1974 requirements for metalworking equipment (see Appendix). Foreign manufacturers supplied 64% of the market in 1972 and are expected to supply 75%, or more than \$145 million, of the country's purchases in 1978. Factors underlying this increased dependence on foreign suppliers include more user interest in sophisticated types of metalworking equipment, a recent reduction in import duties, the existence of ample reserves of foreign exchange, and limited expansion of the domestic metalworking equipment industry.

The United States should nearly double its share of Australian imports of metalworking equipment from 20% in 1972 to 39% in 1976; U.S. sales could rise sharply from \$14.9 million in 1972 to almost \$55 million in 1976 (see table 2). Recent worldwide currency alignments and the successive price increases effected by German, Italian, and Japanese suppliers have generated a marked upsurge

of interest in American equipment. U.S. manufacturers have an unparalleled opportunity to establish themselves in a market traditionally dominated by the United Kingdom and other European nations.

The United Kingdom has been Australia's principal supplier of metalworking equipment, largely because of the historically close political and economic ties between the two nations. British sales in 1972 totaled \$24 million, or 33% of the import market. Recently, however, the United Kingdom has not been able to offer the specialized machinery now in high demand. Moreover, British goods will no longer be given preferential treatment in the form of lower tariffs that Australia, as a member of the British Commonwealth, formerly granted in return for similar treatment of Australian goods entering the United Kingdom. The European Economic Community, which Britain has recently joined, forbids its members to participate in such preferential agreements. Trade analysts predict that the United Kingdom share of the market will drop to 13% in 1976.

Germany ranks third, after the United Kingdom and the United States, with a 17% share of Australia's 1972 imports of metalworking equipment; its sales totaled \$12.7 million. Although Germany's market share could drop to 12% by 1976, Germany will remain the United States' strongest competitor in the Australian market since both countries excel in manufacturing the most advanced types of equipment. Japan is expected to increase its participation in the Australian market in the years ahead. Vigorous promotional activity yielded Japanese

Table 1.—Australia: Consumption¹ of metalworking equipment, 1972, 1974, and 1978²
(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories, tools and dies	Total
1972				
Production	11.9	18.7	22.0	52.6
Imports	37.5	14.2	21.6	73.3
Exports	1.7	3.3	6.2	11.2
Consumption	47.7	29.6	37.4	114.7
1974				
Production	13.6	26.0	29.1	68.7
Imports	57.8	21.9	34.4	114.1
Exports	2.6	5.2	9.8	17.6
Consumption	68.8	42.7	53.7	165.2
1978				
Production	9.1	28.5	32.9	70.5
Imports	75.2	28.5	43.1	146.8
Exports	3.4	6.7	12.7	22.8
Consumption	80.9	50.3	63.3	194.5

¹ Consumption equals production plus imports minus exports.

² Years ending June 30.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Australian trade source estimates and official trade statistics.

manufacturers a 9% share of the 1972 market, and Japan is expected to win a 17% share of the 1976 market.

Australia purchases modest quantities of standard-type machine tools from Eastern European countries, the U.S.S.R., and the People's Republic of China. Imports from these regions are likely to assume greater importance during the years ahead.

American exporters are expected to achieve their biggest sales gains in metal cutting machine tools. This segment of the market is dominated at present by the United Kingdom, Germany, and Japan. The U.S. share of 1972 imports was a modest 8%; trade analysts suggest this proportion could be boosted substantially by 1976.

It seems most likely, however, that U.S. manufacturers of metal cutting machine tools will continue to encounter stiff competition from well-established British, German, and Japanese suppliers. The United Kingdom has successfully marketed universal-type equipment that is adaptable to the individual requirements of the Australian user. German manufacturers have a reputation for producing excellent-quality, highspeed, large-capacity equipment and numerically controlled (NC) machines, and Japan, which has successfully sold reasonably-priced small lathes, grinders, and semiautomated equipment to Australian users, is actively promoting a broader range of machinery and may substantially increase its share of the metal cutting machine tool import market.

The United States, Germany, and the United Kingdom have roughly equal shares of the Australian market for metal forming machine tools. U.S. sales in 1972 totaled \$4.1 million, or 29% of the import market. Both American and Japanese manufacturers are expected to improve their sales position at the expense of the other suppliers.

American exporters, who hold a commanding lead in the Australian import market for tools and dies for machine tools, sold 45% of the \$6.3 million worth of such goods purchased from foreign sources in 1972. Both the United States and Japan stand a good chance of gaining additional sales of tools and dies at the expense of the United Kingdom. A simi-

Australia—Age of metalworking and finishing equipment currently in use

Age of equipment	Percent
Less than 5 years old	26
6 to 10 years old	26
11 to 15 years old	28
Over 15 years old	20
Total	100

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

lar development is foreseen in the market for imported parts and accessories for machine tools, a market that was worth almost \$8 million to the United States in 1972.

Sales Opportunities

A market research study recently conducted in Australia for the U.S. Department of Commerce, Office of International Marketing, identified a number of items for which American exporters of metalworking equipment should find good sales opportunities. Much of the information used in selecting the machinery to be discussed in the following paragraphs was developed from questionnaires completed by individual end-users.

Drilling machines.—The Australian market for drilling machines, including combined drilling, boring, and milling machines, was valued at \$6 million in 1972. Imports accounted for \$4.3 million of this figure. The United States sold Australia approximately \$400,000 worth of drilling machines, chiefly those types exceeding 2 inches in capacity and floor-type combination boring, drilling, and milling machines.

Sales of imported and domestic drilling machines could total nearly \$9 million in 1978, mainly because of growing demand in the motor vehicle industry. Potential customers will pay particular attention to American equipment because of its quality and proven reliability.

The United Kingdom is by far the most important

Table 2.—Australia: Imports of metalworking equipment, from selected countries, 1972¹
(in thousands of U.S. dollars)

Equipment	U.S.	U.K.	Germany	Japan	Italy	Other	Total
Metal cutting machine tools	3,110	13,373	7,527	4,407	1,807	7,323	37,547
Metal forming machine tools	4,100	4,031	3,702	689	607	1,094	14,223
Subtotal metalworking equipment	7,210	17,404	11,229	5,096	2,414	8,417	51,770
Machine tool parts and accessories, and tools and dies	7,685	6,581	1,502	1,260	219	4,332	21,579
Total	14,895	23,985	12,731	6,356	2,633	12,749	73,349

¹ Year ended June 30.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Australian official trade statistics.

source of drilling machines. In 1972, when the British held a 43% share of this segment of the import market, Japan, Sweden, Germany, and the United States had comparatively small shares ranging from 8 to 12%. Domestic drilling machine manufacturers, such as F. W. Hercus Pty. Ltd., Theo Park & Son Pty. Ltd., and Waldown Pty. Ltd., pose little threat to foreign suppliers.

The following types of U.S.-made drilling machines are reported to be in especially high demand:

- Drilling and tapping machines
- Deep-hole drilling machines
- Gang drilling machines
- Multispindle drilling machines
- NC drilling machines
- Radial drilling machines

Grinding machines.—Australian industry purchased \$7.8 million of grinding machines in 1972. Approximately \$6.3 million of this equipment was imported. Shipments from American suppliers in that year were limited to a modest quantity of tool and cutter grinding machines, surface grinders, and honing, lapping, and polishing machines.

A long-term upward trend in demand for grinding machines should accompany the expected expansion of the Australian economy as a whole. Sales of grinding machines could total \$16.2 million in 1978.

Domestic manufacturers, such as L. B. Stockdale Pty. Ltd., supply only about 20% of the market for grinding machines. Australian end-users have been buying most of this equipment from the United Kingdom, Germany, and Japan. Now that tariff cuts and currency realignments have combined to significantly reduce the price of U.S. equipment, however, aircraft repair shops, metal products manufacturers, and makers of motor vehicle components are interested in buying high-quality, American-made grinding machines, particularly:

- External universal grinding machines
- External centerless grinding machines
- External cylindrical grinding machines
- Plunge grinding machines
- Special-purpose grinding machines
- Tool and cutter grinding machines

Milling machines.—Since there is no domestic production of milling machines, Australia's requirements for these items are supplied entirely from abroad. Imports amounted to \$5.8 million in 1972 and could reach \$10 million in 1978.

U.S. sales of milling machines, which totaled nearly \$1 million in 1972, consisted primarily of fixed-bed and specialized types. Some American manufacturers also shipped significant quantities of milling machines from their manufacturing subsidiaries in England. Total imports from the United Kingdom accounted for 30% of the market, and Germany ranked behind the United Kingdom and

the United States with 12% of 1972 imports. The following items present the best opportunities for U.S. exporters of milling machines:

- NC milling machines
- Horizontal and vertical bed-type milling machines
- Copy milling machines
- Crankshaft milling machines
- Die-sinking milling machines
- Knee and column milling machines (horizontal, vertical, and universal)
- Rise and fall milling machines

Mechanical presses.—The Australian market for mechanical presses is estimated to have been \$35.7 million in 1972, when imports totaled \$2 million. Projections for 1978 indicate that the market for domestic and imported presses is likely to double, principally because motor vehicle manufacturers have increasing requirements for these machines.

Australian industry buys most of its smaller (under 125-ton capacity) presses from domestic manufacturers. The larger capacity and higher speed presses, as well as any special types, are almost always imported. The United States is the principal supplier, accounting for nearly two-thirds of the import market; the United Kingdom, Germany, and Japan follow, in that order. Major domestic manufacturers of presses include Perry Engineering Co. Ltd., Vickers Ruwolt Ltd., Bliss Welded Products Ltd., and John Heine & Son Pty. Ltd.

Potential customers, especially those in the motor vehicle industry, are specifically interested in machinery that can help reduce the need for skilled workers. Skilled labor has always been in short supply in Australia, and recent industrial strife has further aggravated the manpower problem. Types of machinery which should sell well in the years just ahead include:

- Automatic high-speed presses
- Multiple transfer automatic presses
- Vertical straight-side single-action presses (single-point, two-point and four-point)
- Rotary die presses
- Open-back inclinable presses, over 125 tons
- Friction screw presses

Turning machines.—Demand for lathes is rising steadily as engineering firms, machine shops, and other individual users in Australia strive to upgrade their equipment during the current period of prosperity. Australia imports most of its lathes. Those made locally, by such firms as F. W. Hercus Pty. Ltd., McPherson's Ltd., Nutall Engineering Pty. Ltd., and Tullock Ltd., are available in only a few sizes and models. Furthermore, many users are highly brand conscious and insist on lathes bearing the names of well-known overseas manufacturers. Imports of turning machines amounted to \$14.7 million in 1972 and may exceed \$30 million in 1978. American exporters shipped \$1 million of

Table 3.—Australia: End-users of metalworking and finishing equipment, by industry, 1970¹

Industry	No. of manufacturers	Value of sales (in millions of U.S. dollars)	Value of capital expenditures	No. of workers
Primary nonferrous metal products	287	1,181.2	169.8	23,185
Primary iron and steel products	364	1,684.6	96.9	70,146
Motor vehicles and parts	937	1,913.8	81.2	88,156
Appliances and electrical equipment	1,470	1,561.7	45.4	107,409
Industrial machinery and equipment	3,039	1,125.2	41.4	81,669
Transportation equipment other than motor vehicles	612	546.8	35.2	61,972
Sheet metal products	1,044	494.9	23.9	33,618
Fabricated metal products other than sheet metal	2,418	667.2	22.5	51,690
Fabricated structural metal products	1,618	535.5	14.9	36,416
Photographic, professional and scientific equip- ment	300	100.2	5.1	8,199

¹ Year ended June 30.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Australian official trade statistics.

lathes to Australia in 1972, the bulk of these being fully automatic multispindle lathes and turret lathes. Nearly 40% of the lathes purchased abroad in that year were imported from the United Kingdom, while 21% came from Germany, 15% from Japan, and 8% from the United States. Promotional campaigns designed to increase sales of the following types of U.S.-made lathes should meet with a favorable response:

- NC engine lathes
- Gap bed engine lathes
- Toolroom and engine lathes
- Center drive lathes
- Multispindle horizontal bar lathes
- Bar, single-spindle lathes
- Horizontal and vertical, chucking, multispindle lathes
- Single-spindle chucking lathes

Other Sales Opportunities.—Additional types of equipment for which American exporters should find strong demand among Australian users include: electrical discharge machining (EDM) and electrochemical machining (ECM); bending and forming machines; NC machines; boring machines; digital readouts; metal parts cleaning and finishing equipment; and accessories, tools, and dies for machine tools. The import market for many of these equipment items is expected to show better than an 8% annual growth during the 1972-78 period.

Australian demand for NC metalworking equipment is approaching the takeoff point. The number of NC machine tools in use more than doubled between 1967 and 1969, and indications are that the number of installations will continue to rise rapidly. Digital readout systems are also in great demand. This development is part of a generally increased interest in equipping plants with larger and more complex machinery. Australia's chronic shortage of skilled labor and the recent series of generous wage

increases are key factors in this trend, but manufacturers are also interested in saving on the costs of quality control, storage of jigs and fixtures, and on inventory management.

Both EDM and ECM are beginning to be used in Australia. The adoption of EDM technology had been hampered by inadequate training programs and inexperienced personnel. These obstacles are being overcome by promotional and instructional campaigns mounted by manufacturers' representatives. Moreover, Australian industrialists have had opportunities to observe EDM equipment in operation in other countries.

End-User Industries

Australian industries using metalworking equipment recorded sales of \$9.8 billion in 1970 (see table 3). In that year, the more than 12,000 manufacturers included in these broadly defined industries employed 562,000 workers and spent \$536 million for capital goods.

The 10 principal end-users accounted for \$5.6 billion in sales in 1970 and \$278 million in capital spending (see table 4). This list of key metalworking equipment consumers includes some of Australia's most dynamic industries; their total capital expenditures are expected to rise by an average of nearly 8% per year from their 1974 level, reaching \$670 million in 1978 (see table 5). Five of these industries have been selected for discussion in the following paragraphs.

Primary iron and steel products.—Australia's iron and steel industry has developed rapidly. Continual expansions of plant capacity have boosted output of pig iron and of steel ingots by an average of more than 8% per year since 1950. Production of castings and forgings has also risen dramatically.

Broken Hill Proprietary Co. Ltd. (BHP), Aus-

Major end-user firms and prospective customers in Australia for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—Australia*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Australia's largest firm and a corporation of world rank, dominates the industry. BHP plans to double its output of raw steel during the next 10 years. Its new plant complex at Westernport, Victoria, which will cost \$1.5 billion and will include a cold strip plant, a hot strip plant, and an integrated iron and steel works, is scheduled to be completed by 1985. Another major firm, Armco Steel Corp., plans to begin

Table 4.—Australia: Principal end-users of metalworking and finishing equipment, by industry sector, 1970¹

Sector	No. of manufacturers	Value of sales (in millions of U.S. dollars)	Capital expenditures
Primary iron and steel products, excluding pellets, castings and forgings, and pipes and tubes	96	1,296.6	86.7
Motor vehicles (excluding trucks and buses), and parts	566	1,745.1	76.6
Aircraft construction and repair	43	122.4	27.2
Miscellaneous industrial machinery and equipment	1,479	428.4	17.6
Refrigerators and home appliances	309	459.6	12.9
Miscellaneous electrical machinery and equipment	746	466.8	12.5
Television, radios, and miscellaneous electronic equipment	901	282.8	11.4
Metal containers	75	176.3	10.9
Fabricated structural steel	941	319.6	9.9
Subtotal 10 principal sectors	5,383	5,655.6	277.8
Subtotal all other sectors	6,706	4,155.6	258.7
Total all end-users	12,089	9,811.2	536.5

¹ Year ended June 30.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Australian official trade statistics.

work shortly on a \$450-million steel mill to be located in the state of Western Australia.

BHP alone may spend approximately \$30 million on metalworking equipment during the next 5 years to help the firm's machine and service shops handle increased steel production and enable them to replace obsolete equipment. Part of BHP's machine-shop modernization program calls for the eventual purchase of American-made NC engine lathes and center lathes. Other steel firms are also considering the purchase of NC equipment. Specific metalworking equipment items with promising sales opportunities for U.S. exporters between now and 1978 include:

- Large backup roll grinders
- Large borers
- General and special-purpose lathes
- Plasma arc cutting machines
- Milling machines
- EDM and ECM machines

Motor vehicles and parts.—The motor vehicle industry is of critical importance to the Australian economy, not only because it attracts capital and provides jobs but also because exports of motor vehicles represent a substantial portion (15% in 1972) of the country's total exports of manufactured goods. The number of new vehicles being registered is rising at the rate of 6% per year; registrations exceeded 500,000 in 1972.

Australian subsidiaries of General Motors Corp., Ford Motor Co., Chrysler Corp., and British Leyland Motors dominate the manufacture of motor vehicles other than trucks and buses. More than 85% of the necessary components are manufactured in Australia, and the figure is at least 95% for the more popular models. A number of independent companies participate in the production of component parts. Borg Warner Co., one of the leaders, is planning a \$60-million expansion of its plant.

Purchases of metalworking equipment accounted for the bulk of the sector's 1972 capital expenditures of \$81 million; spending for machine tools is expected to rise by 6 to 7% per year through 1978. Anticipating rapid growth in exports as well as a steady increase in domestic sales, Australian automakers are keenly interested in buying machinery capable of handling larger volumes. There is intense interest in more automatic assembly equipment, transfer machines, EDM, and ECM.

Aircraft construction and repair.—This industry had grown rapidly; production rose by 15% per year between 1969 and 1973. The three major firms in the industry—Commonwealth Aircraft Corp., Hawker de Havilland, and the Government Factory—have depended on military spending for 90% of their business. Because of this dependence the Labor Government's decision to scrap a number of defense-related programs, notably the building of

new fighter planes, clouds the industry's immediate future.

In light of this recent development, aircraft manufacturers plan to build more commercial aircraft and are preparing to negotiate cooperative production agreements with overseas aircraft producers. If a number of major contracts materialize, considerable investment in equipment will be needed for retooling. In the meantime, major airline maintenance shops continue to be steady customers for imported metalworking and finishing equipment.

Specific U.S.-made equipment of interest to the Australian aircraft industry includes:

- NC milling machines
- NC lathes
- Boring machines
- Drilling machines
- Grinding machines
- Mechanical and hydraulic presses

Miscellaneous industrial machinery and equipment.—This sector, which includes the manufacturers of a broad range of products such as air compressors, shoe machinery, cigarette-making machinery, fiber presses, heat exchangers, bottling machines, sewing machines, wire-coiling machines, wool presses, plastic processing machines, and liquid-spraying machines, has been expanding by approximately 10% per year. The industry may face increased competition from imports beginning in 1975. An inquiry now being conducted by the Tariff Board could result in a recommendation that tariffs on many types of industrial equipment and machinery be reduced or eliminated. Faced with this possibility, the industry already is moving toward greater use of NC machinery in an effort to reduce soaring production costs. Manufacturers of miscellaneous industrial machinery and equipment are especially interested in these types of U.S.-made equipment:

- NC boring and drilling machines
- Multispindle drilling machines
- Mechanical presses
- Lathes
- Cylindrical grinding machines
- Milling machines
- Bending and forming machines

Refrigerators and other home appliances.—Australian spending for consumer durables is at a record level, and manufacturers are having difficulty in expanding their output enough to keep pace with demand. Many models are in short supply despite production increases of as much as 10% in the first quarter of 1974 over the comparable 1973 period. Now that the Government is considering the reduction or elimination of tariffs that have long protected the industry, manufacturers of major home appliances are stepping up their purchases of metalworking equipment, particularly NC machinery and EDM, in the hope that by cutting pro-

Table 5.—Australia: Capital expenditures of principal end-users of metalworking and finishing equipment, 1970, 1974, and 1978¹
(in millions of U.S. dollars)

Sector	1970	1974	1978
Primary iron and steel products, excluding pellets, castings and forgings, and pipes and tubes ..	86.7	161.6	226.3
Motor vehicles (excluding trucks and buses), and parts	76.6	137.6	195.3
Aircraft construction and repair ..	27.2	48.8	51.2
Miscellaneous industrial machinery and equipment	17.6	29.4	37.7
Refrigerators and home appliances	12.9	21.3	24.5
Miscellaneous electrical machinery and equipment	12.5	20.4	25.3
Television, radios and miscellaneous electronic equipment	12.1	20.3	32.5
Miscellaneous sheet metal products	11.4	21.2	30.1
Metal containers	10.9	17.9	22.6
Fabricated structural steel	9.9	17.7	24.8
Total	277.8	496.2	670.3

¹ Fiscal year ending June 30.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Australian trade source estimates and official trade statistics.

duction costs they can remain competitive with imported goods. Market analysts characterize the following American-made equipment as having good sales potential:

- Jig boring machines
- Drilling and tapping machines
- NC drilling machines
- External universal grinding machines
- NC grinding machines
- Profile milling machines
- Engine lathes
- Thread-rolling machines
- Automatic turning lathes

Domestic Manufacture of Metalworking Equipment

Australian production of metalworking equipment approached \$53 million in 1972 and nearly \$69 million in 1974. Output is not expected to increase much between 1974 and 1978; projections place 1978 production at \$70 million. The Government Tariff Board determined in 1972 that the machine tool industry ought not to be encouraged to expand beyond the range within which it currently operates because of its high production costs and the limited market it serves. It is considered desirable, however, that a nucleus of the industry be maintained for defense purposes.

Approximately 40 companies make up the metalworking equipment industry. Australian manufacturers tend to specialize in small- and medium-size general-purpose machinery. They make only 14

classes of equipment and market them in fewer than 300 sizes.

Specific types of equipment produced in Australia include lathes; chucking and turning machines; drilling, boring, and broaching machines; screw thread, chasing, and tapping machines; milling and hobbing machines; hydraulic and mechanical presses; bending machines; forging, hammering, and straightening machines; dies, taps, and chasers; twist drills; and a variety of machine tool accessories and parts.

Assisted by a liberal export incentive program, Australian manufacturers exported \$11 million of metalworking equipment in 1972 and almost \$18 million worth in 1974. Despite the planned phasing-out of the incentive program, exports are likely to exceed \$22 million in 1978, which would raise to almost one-third the proportion of domestic production being sold in world markets. Most of the equipment consists of parts, accessories, and tools and dies for machine tools sold to Southeast Asian nations.

Four subsidiaries of foreign corporations participate in machine tool manufacture in Australia. E. W. Bliss Co. (United States) owns a controlling interest in Bliss Welded Products Ltd., which makes heavy engineering equipment, rolling mills, and presses. Bendix Corp. (United States) has a wholly-owned Australian subsidiary, Bendix Corp. Australia, that produces special-purpose machinery for cutting and manipulating metal. Taylor-Winfield (United States) owns a part interest in R. V. Dorman and Co. Pty. Ltd., a manufacturer of drilling, boring, tapping, and milling machines. The British-owned Vickers Ltd. holds a controlling interest in Vickers Ruwolt Pty. Ltd., which makes hydraulic and mechanical presses.

Only three companies have licensing agreements with foreign metalworking and finishing equipment manufacturers. G. L. Sheraton Pty. Ltd. has an agreement with England's Colchester Lathe Co.; L. B. Stockdale Pty. Ltd. has licensing agreements with Joseph F. Lamb (United States) and Newell Machine Tool Co. of the United Kingdom; and Vickers Hoskins Pty. Ltd. manufactures under license from the British firm of William Asquith, Ltd.

Trade Regulations and Practices

Customs duties applicable to metalworking and finishing equipment imported into Australia from the United States range from zero to 30%. Most shipments, however, enter free of duty or at significantly reduced rates under the so-called tariff "by-law" concessions. These concessions are granted on a case-by-case basis where goods "suitably

equivalent" to the imported goods are not "reasonably available" from Australian manufacturers; "reasonable availability" can refer to price as well as delivery time.

Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4217, Main Commerce Building, Washington, D.C. 20230.

Metalworking and finishing equipment usually is sold through dealers. There are about 100 such dealers in Australia, a few of which are subsidiaries of foreign machine tool manufacturers.

Installation of machinery usually is requested of the seller; in fact, a customary practice is to retain 10% of the payment until the machinery is installed and operating. Purchasers look for 6- to 12-month warranties and guarantees from the supplier. The seller's spare parts inventory and maintenance capability are often key factors in purchase decisions, especially in those made by large buyers. Only a small proportion of metalworking and finishing is leased—generally by large companies seeking tax concessions.

Technical Requirements

Technical standards applicable to metalworking and finishing equipment intended for use in Australia are established and issued by the Standards Association of Australia Standards House, 80 Arthur Street, North Sydney, N.S.W., Australia 2060; and by the National Standards Commission, CSIRO University Grounds, Chippendale, N.S.W., Australia. U.S. standards are acceptable.

The characteristics of Australia's electrical supply are 240 volts, 50 hertz, 3-phase. Although the imperial system of weights and measures is still acceptable in Australia, the metric system is widely used and will be used exclusively by 1980.

Published national standards for metalworking and finished equipment in Australia may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230: "The Market for Metalworking and Finishing Equipment in Australia," DIB 74-08-502, January 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Australia. The table gives the value in U.S. dollars of various items of metalworking equipment imported by Australia in 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Australia: Imports of metalworking equipment 1972-78, alternate years
(in thousands of U.S. dollars)

Type of Equipment	1972	1974	1976	1978
<i>Metal Cutting:</i>				
Combined boring, drilling, milling machines, table type	288	442	548	575
Combined boring, drilling, milling machines, floor type	1,324	2,036	2,525	2,650
Combined boring, drilling, milling machines	277	426	527	552
Combined boring/reaming, boring, drilling machines	15	22	26	28
Vertical boring machines	66	101	125	131
Vertical turning/boring machines with rotary table	757	1,165	1,443	1,515
Vertical boring machines	326	502	621	651
Horizontal boring machines	1,411	2,168	2,688	2,823
Boring machines	465	715	886	929
Radial drilling machines, under 4 ft. 6 in.	292	448	555	582
Radial drilling machines, not exceeding 8 ft.	392	601	744	780
Radial drilling machines, over 8 ft.	73	111	138	144
Drilling machines, capacity not exceeding 1 in.	203	378	563	406
Drilling machines, capacity exceeding 1 in.	457	703	871	914
Drilling machines, n.e.s., not exceeding 1.25 in. capacity	51	77	95	99
Drilling machines, n.e.s., not exceeding 2 in. capacity	6	8	10	10
Drilling machines, n.e.s., exceeding 2 in. capacity	955	1,469	1,820	1,911
Grinding, honing, polishing machines	546	840	1,041	1,092
Bench grinding machines	128	196	242	254
Camshaft grinding machines	128	196	242	254
Crankshaft grinding machines	237	363	449	472
Cylindrical grinding machines, universal	138	211	262	274
Cylindrical grinding machines	389	597	738	772
Centerless grinding machines	487	749	928	974
Internal grinding machines	506	777	964	1,011
Tool cutter grinding machines	525	807	1,001	1,050
Surface grinding machines, up to 40 in. table traverse	617	949	1,175	1,233
Surface grinding machines, exceeding 40 in.	287	441	546	573
Surface grinding machines, rotary table	288	442	548	575
Surface grinding machines, n.e.s.	403	619	767	804
Grinding, honing, polishing machines	1,613	2,220	2,879	3,603
Lathes, center height not exceeding 5.5 in.	339	521	646	677
Lathes, center height exceeding 5.5 in.	1,509	3,537	4,072	3,929
Lathes, general-purpose, n.e.s.	1,413	2,175	2,696	2,831
Lathes, fully automatic	723	1,111	1,378	1,446
Lathes, fully automatic, single spindle	971	1,492	1,850	1,942
Lathes, fully automatic, single spindle, n.e.s.	1,124	1,621	2,144	2,249
Lathes, fully automatic, multispindle	1,530	2,354	2,198	3,063
Lathes, fully automatic, chucking type	250	384	475	497
Lathes, fully automatic, multispindle, n.e.s.	464	713	883	911
Lathes, capstan	661	1,016	1,259	1,321
Lathes, rollturning	801	1,232	1,527	1,603
Lathes, turret	1,392	2,141	2,653	2,786
Chucking machines	508	782	969	1,017
Copy turning lathes	712	1,095	1,357	1,421
Lathes, n.e.s.	2,270	3,494	4,331	4,547
Milling machines, die-sinking	210	321	397	417
Milling machines, vertical spindle	1,505	1,926	2,388	2,507
Milling machines, horizontal spindle	799	1,229	1,510	1,585
Milling machines, n.e.s.	257	394	488	512

Australia: Imports of metalworking equipment 1972-78, alternate years—Continued

(in thousands of U.S. dollars)

Type of Equipment	1972	1974	1976	1978
Milling machines, fixed bed	830	1,276	1,582	1,661
Milling machines, turret head	189	290	359	376
Milling machines, n.e.s.	2,049	2,719	3,371	3,540
Hobbing machines	598	919	1,139	1,196
Broaching machines, internal	30	44	55	41
Broaching machines	111	169	210	220
Gear shaping machines	143	219	271	284
Shaping machines	148	226	280	293
Planing machines	208	320	396	442
Slotting machines	142	217	269	283
Shaving machines	73	111	138	144
Hacksawing machines	226	347	429	449
Bandsawing machines	263	403	500	524
Circular cold sawing machines	590	908	1,126	1,181
Sawing or filing machines, n.e.s.	208	320	396	415
Screwing, chasing, tapping machines (excluding lathes)	651	1,001	1,241	1,302
Total	37,547	57,806	71,670	75,253
<i>Metal forming:</i>				
Shears, metalworking	248	382	473	496
Shears, hydraulic guillotine, metalworking	403	619	767	804
Shears, mechanical	67	101	125	131
Shears, n.e.s.	1,445	2,224	2,757	2,895
Embossing machine for preparing addressing machine plates	24	35	43	44
Riveting machines	137	210	259	271
Plate straightening machines	6	8	10	10
Hydraulic metalworking presses, n.e.s.	998	1,534	1,902	1,996
Metalworking presses, n.e.s.	2,005	3,085	3,826	4,017
Forging, hammering, bending, straightening machines, n.e.s.	794	1,221	1,513	1,588
Machine tools for working metal, n.e.s.	8,093	12,463	15,454	16,226
Total	14,223	21,882	27,129	28,478
<i>Parts, accessories, tools and dies:</i>				
Pneumatic chucks for metalworking machines	48	73	89	93
Chucks, excluding pneumatic	600	922	1,142	1,199
Cullets, feed fingers	128	196	242	254
Lathe tool holders	512	786	974	1,022
Vises for metalworking machines	54	81	101	105
Copying attachments	150	229	283	296
Indexing tables for metalworking machines	121	186	230	241
Work holders, n.e.s.	108	165	204	213
Tool holders, n.e.s.	290	447	554	581
Parts for lathes	1,277	1,965	2,436	2,556
Parts for metalworking machines, n.e.s.	3,126	4,811	5,964	6,262
Chucks	461	709	879	916
Tool holders	14	20	25	25
Accessories	657	1,010	1,251	1,314
Straight shank twist drills in sets	93	1,414	174	181
Straight shank twist drills, excluding in sets	253	388	481	505
Taper shank twist drills	61	92	113	117
Non-twist drills	11	16	19	19
Twist drills	6	8	10	10
Drills, bits	95	146	180	189
Masonry drills	302	464	575	603
Drills, n.e.s.	96	147	181	190
Auger bits	70	107	132	138
Rockdrill bits, not exceeding 4 in. diameter	1,796	2,765	3,428	3,599
Rockdrill bits, exceeding 4 in. diameter	4,658	7,169	8,889	9,333
Rockdrill steels	202	311	385	403

Australia: Imports of metalworking equipment 1972-78, alternate years —Continued

(in thousands of U.S. dollars)

Type of Equipment	1972	1974	1976	1978
Dies, taps, chasers in sets	467	718	889	932
Taps, high-speed steel	183	281	348	365
Taps, excluding high-speed	69	105	131	137
Button dies	5	5	5	5
Flat, circular thread rolling dies	43	46	56	58
Chasers	51	77	95	99
Screwing tools, n.e.s.	126	193	239	251
Bore type milling cutters	98	149	184	193
Shank type milling cutters	114	175	217	227
Milling cutters, n.e.s.	275	423	524	549
Reamers	112	171	211	222
Rod, wire drawing dies	100	153	189	198
Bolt, screw heading dies	7	10	11	11
Interchangeable tools for hand tools	2,092	3,219	3,991	4,189
Interchangeable tools not designed for use with non-mechanical hand tools	2,543	3,914	4,852	5,094
Interchangeable tools	105	160	198	207
Total	21,579	34,426	41,081	43,101
Grand total metalworking equipment	73,349	114,114	139,880	146,832

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and Australian trade source estimates.

Brazil

Several years of extraordinary economic expansion pushed Brazil's gross national product to nearly \$56 billion in 1973, the sixth consecutive year in which annual growth was in the 10% range. Industrial production in that year exceeded \$27 billion, while the value of capital investment reached \$9.2 billion.

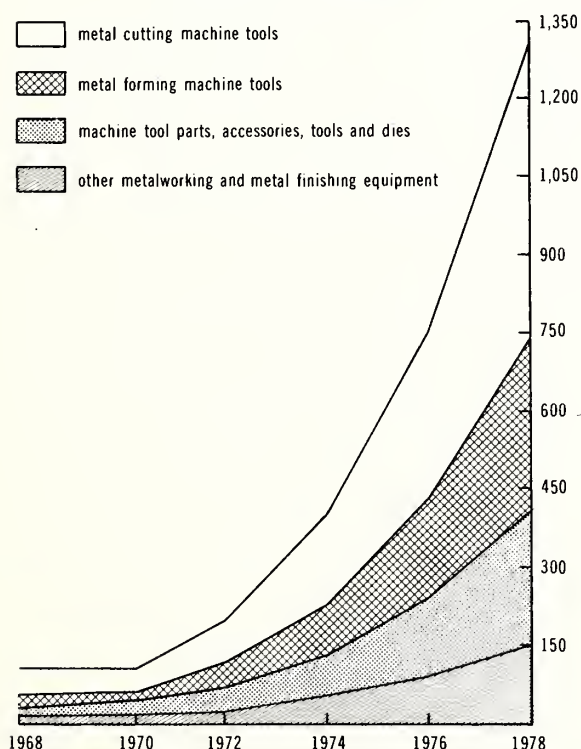
During this period of strong economic growth, virtually every branch of the Brazilian economy was mobilized to increase exports of manufactured products, upgrade the nation's communications and transportation infrastructure, and, to a lesser extent, reduce the nation's dependence on imported goods. While impressive gains were made in expanding and reequipping plant facilities, Brazilian industry currently finds itself operating close to the limits of its installed capacity. Manufacturers therefore must continue to invest substantial sums in metalworking and finishing equipment, as well as in other capital goods, if Brazil is to meet export goals and economic development objectives.

Consumption of metalworking and finishing equipment (MFE) was seen exceeding \$400 million in 1974, double the 1972 level of \$197 million (see table 1). The market's annual growth during the 1974-78 period is forecast at approximately 35%, compared with the 25% realized in 1968-74¹; consumption therefore should amount to about \$1.3 billion in 1978.

Almost 60% of the machine tools now in use in Brazil were acquired prior to 1962, during the years when the country was undergoing rapid industrialization. Purchases continued at a more moderate pace during 1963-67, but, owing to a lack of real economic growth during that highly inflationary period, a certain amount of excess capacity developed in user industries. This served to reduce the rate of investment in metalworking and finishing equipment in 1968-73 below what it normally would have been under conditions of rapid real growth.

Consumption of metal cutting machine tools, placed at \$82 million in 1972, approached \$170 million in 1974 and is likely to approximate \$560

Figure 1.—Brazil: Consumption of metalworking and finishing equipment, 1968-78, alternate years
(in millions of U.S. dollars)



Source: U.S. Department of commerce, Bureau of International Commerce market research study. Values based on Brazilian trade source estimates and official trade statistics.

¹ Growth rates computed using dollar figures converted at the official weighted average of exchange rates prevailing in each year.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	Cr. \$/US\$1.00
1968	3.577
1970	4.564
1972	5.930
1973-78	6.120

million in 1978. Growth rates should average 35% during the 1974-78 period, compared with 25% between 1968 and 1974. Brazilian industry utilized approximately \$100 million in metal forming machine tools during 1974, double the 1972 consumption. Demand for such equipment is expected to rise by nearly 35% annually to more than \$330 million in 1978. Growth in this sector of the MFE market in the 1968-74 period averaged 30%. The market for metal finishing equipment should expand rapidly from its modest 1974 base of \$3 million to almost \$10 million in 1978. Users had purchased a mere \$700,000 worth of such equipment in 1968.

Domestic production of metalworking and finishing equipment falls far short of Brazil's needs; moreover, the industry is unlikely to be able to keep pace with future market growth. In 1974, users purchased less than 25% of their MFE needs from local manufacturers. Projections indicate that output could dip to a record low of 10% in 1978,

despite expected improvements in the MFE industry's structure and technology. Backlog, which was equal to about 9 months' production at the end of 1972, was estimated to be twice as large at the close of 1974.

Imports more than doubled between 1968 and 1972, accelerating from \$54 million to \$142 million. Indications are that official 1974 figures may show a further twofold increase when compared with those for 1972. The outlook is for such shipments to climb by 35 to 40% per year during the 1974-78 period (see Appendix).

American exporters gained a 35% share of the Brazilian market for imported metalworking and finishing equipment in 1972 (see table 2). Germany followed close behind with 30%. Italy (6%), the United Kingdom (5%), and Japan (5%) shared the balance of the import market with other—mainly Eastern European—countries. Little change in the relative positions of the various supplier nations is likely to occur during the 1974-78 period with the exception of Japan, whose share may increase significantly if Japanese companies boost their already substantial investments in Brazilian industry. Even without improving their market shares, foreign suppliers will realize unprecedented gains in sales to this fast-growing market. Imports from the United States for example, could amount to more than \$412 million in 1978, compared with \$50 million in 1972.

Table 1.—Brazil: Consumption¹ of metalworking and finishing equipment, 1968, 1972, 1974 and 1978 (in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories, tools and dies	Metal finishing equipment	Other	Total
1968						
Production	16.6	11.7	15.1	0.3	6.2	49.9
Imports	31.6	8.7	8.0	.4	5.2	53.9
Exports	2.1	.1	1.4	—	.1	3.7
Consumption	46.1	20.3	21.7	.7	11.3	100.1
1972						
Production	22.2	15.6	20.2	.4	8.3	66.7
Imports ²	62.7	36.2	27.0	1.1	15.0	142.0
Exports	3.1	1.4	6.6	.2	.4	11.7
Consumption	81.8	50.4	40.6	1.3	22.9	197.0
1974						
Production	28.8	20.2	26.2	.6	10.8	86.6
Imports	144.2	83.3	62.0	2.6	34.6	326.7
Exports	3.7	1.6	7.8	.2	.4	13.7
Consumption	169.3	101.9	80.4	3.0	45.0	399.6
1978						
Production	48.6	34.2	44.3	.9	18.3	146.3
Imports	515.2	300.0	221.1	9.2	124.6	1,170.3
Exports	5.6	2.5	11.9	.3	.7	21.0
Consumption	558.2	331.7	253.5	9.8	142.2	1,295.6

¹ Consumption equals production plus imports less exports.

² Brazil adopted Brussels Tariff Nomenclature and use of f.o.b. values in 1971; therefore, data for 1971 and thereafter are not strictly comparable with that of earlier years.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Brazilian official trade statistics and trade source estimates.

Table 2.—Brazil: Imports¹ of metalworking and finishing equipment from selected countries, 1972
(in thousands of U.S. dollars)

	U.S.	Germany	U.K.	Japan	Italy	Other	Total
Metal cutting							
machine tools	19,134	19,498	3,716	2,308	4,673	13,389	62,718
Metal forming							
machine tools	18,867	7,888	1,803	1,709	2,162	3,809	36,238
Subtotal, metal-							
working equipment	38,001	27,386	5,519	4,017	6,835	17,198	98,956
Machine tool parts,							
accessories, tools							
and dies	6,906	13,304	1,123	750	962	3,962	27,007
Metal finishing equipment	406	355	130	14	10	201	1,116
Other	4,379	2,226	1,072	3,119	948	3,305	15,049
Total	49,692	43,271	7,844	7,900	8,755	24,666	142,128

¹ f.o.b. basis.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Brazilian official trade source estimates.

The United States supplied more than half of the metal forming equipment imported by Brazil in 1972, while Germany, its chief competitor in this market, supplied 22%. On the other hand, the United States and Germany captured equal (31%) shares of the market for metal cutting equipment. American exporters led slightly in sales of metal finishing equipment (36% vs. 32%), but Germany had a decisive lead in supplying parts, accessories, and tools and dies for machine tools.

German manufacturers whose products are familiar to Brazilian users include Gebr. Heller GmbH, FRORIEP GmbH, Rheydt-Schiess S.A., Pittler S.A., and the subsidiary of the U.S. firm Cincinnati Milacron. Other European metalworking and finishing equipment manufacturers whose products have been well accepted in Brazil include: Monzese (Italy); the United Kingdom's Alfred Herbert, Kitchen and Wade, and a British subsidiary of the U.S.-owned Cincinnati Milacron, Ltd.; WMW (German Democratic Republic); and Georg Fischer, S.A., Schaublin S.A., and SCIP (Switzerland).

Market analysts report that Brazilian customers judge foreign metalworking and finishing equipment by its quality. German and U.S. products have long enjoyed an advantage in this regard; nevertheless, United States suppliers have usually led the market because of the advanced technological features of their products and the generally American orientation of Brazilian industry.

Both the United States and Germany have benefited greatly from the fact that their leading car and truck manufacturers are represented in the fast-growing Brazilian motor vehicle industry. In fact, the foreign affiliation of a metalworking and finishing equipment user in any industry can have considerable influence on the origin of equipment selected. Prices, including differences in freight costs, have had no discernible effect on the relative positions of the various MFE supplier nations.

Furthermore, the ready availability of favorable financing from both Brazilian and international banking institutions has greatly reduced the importance of the terms of payment as a competitive weapon.

Sales Opportunities

A market research study recently conducted in Brazil for the U.S. Department of Commerce, Office of International Marketing revealed widespread interest in a variety of U.S.-made metalworking and finishing equipment. Analysis of imports, interviews with trade experts, and the response from a questionnaire mailed to principal MFE user firms indicated certain product subcategories for which American exporters should find particularly promising sales opportunities.

Lathes.—Planned expansion of production facilities, particularly in the auto industry, should generate a 30% annual growth in the market for lathes during the 1972-78 period. Consumption of lathes approximated \$24 million in 1972 and may top \$120 million in 1978. Nearly half of the lathes purchased in 1972 were imported; 17% of imported lathes were bought from the United States. Imports are expected to supply about 75% of consumption in 1978. Buyers are especially interested in automatic lathes, copying lathes, and vertical lathes. Purchases of these types of lathes, which totaled nearly \$8 million in 1972, could reach \$65 million in 1978. Automatic lathes would probably account for \$33 million, or nearly half of the 1978 figure.

Brazilian manufacturers make high-quality lathes; in fact, the domestic MFE industry considers lathes to be their showcase product. Output, however, is totally inadequate to meet rising demand. Firms such as Industrias Romi, S.A.; Industrias Nardini, S.A.; Industrias Micheletto S.A.; and Traubomatic Industria e Comercio Ltda.—all leading domestic

manufacturers of lathes—do not foresee the possibility of expanding production by more than 14% per year during the 1970's. The inevitable shortfall, together with the increased demand for more advanced equipment, seems certain to push imports upward even faster than the 35 to 40% growth rate forecast for the metalworking and finishing equipment market as a whole. These same factors will help American exporters make additional sales. At present, German lathes account for over 40% of total lathe imports. The United Kingdom, with 11% of the market, and Italy, with 7%, are also viable competitors.

Grinding machines.—Brazilian industry absorbed an estimated \$11 million worth of grinding machines in 1972, of which all but \$700,000 worth were purchased abroad. Consumption is forecast to approach \$90 million in 1978. American exporters sold more than \$2 million worth of this type of machinery, claiming a 22% share of the 1972 import market. If this share is maintained, U.S. sales could exceed \$19 million in 1978. Sales prospects are brightest for horizontal grinding machines and centerless grinding machines. Brazil's 1978 imports of horizontal grinding machines are forecast at close to \$10 million; purchases of imported centerless grinding machines are predicted to approach \$12 million. Imports of these two items totaled less than \$3 million in 1972.

Germany was the chief supplier of grinding machines to Brazil in 1972, accounting for 31% of imports. Japan, a newcomer to this market, was responsible for 9% of sales. Domestic producers such as Vigorelli do Brasil S.A., Mello S.A. Maquinas e Equipamentos, and Industria Metalurgica Bovi Ltda. do not produce high precision grinding machines, hence there will continue to be good opportunities for foreign suppliers.

Milling machines.—Brazil's 1972 consumption of milling machines is estimated at \$11 million, of which \$10 million was imported. Since domestic producers are unable to expand output to keep pace with the rise in demand, industry will rely heavily on imported milling machines during the next several years, importing all but 2% (\$1.5 million) of the more than \$85 million worth of milling machines it is expected to purchase in 1978. U.S. manufacturers might consider concentrating their promotional efforts on automatic milling machines and universal milling machines. Brazilian trade sources estimate that foreign firms could sell \$20 million of each of these two types of milling machines in 1978, compared with the \$2.5 million worth of each sold in 1972.

American exporters shared equally with German firms in the 1972 import market for milling machines, recording market shares of approximately 30% each, compared with 11% for Italy. Foreign

suppliers of milling machines encounter little competition from domestic manufacturers who have only limited experience in making such equipment. Leading local producers include Vigorelli do Brasil S.A., Industrias Romi S.A., Mecanica Natal Ltda., Industrias Emanuel Rocco S.A., and Maquinas Sanchez Blanes S.A.

Drilling machines.—The market for drilling machines is estimated at \$7 million for 1972 and forecast at almost \$48 million for 1978. Imports, which provided 75% of the country's drilling machine needs in 1972, are expected to account for nearly 90% of 1978 consumption, as users increasingly demand advanced equipment. American exporters should surely benefit from this market growth since they supply nearly 60% of imports of such machinery; their sales could reach \$25 million in 1978. Multiple drilling machines with multiple spindle headstock and radial drilling machines appear to have the greatest sales potential. Brazil's 1978 imports of these two types of drilling machines could be eight times the 1972 level of \$4 million.

Germany and Italy rank far behind the United States in selling drilling machines to Brazilian users, with 1972 import market shares of 18% and 7%, respectively. Domestic producers pose no threat to foreign manufacturers, whose equipment is usually of more advanced design. Mello S.A. Maquinas e Equipamentos, Industrias Emanuel Rocco S.A., Maquinas Sanchez Blanes S.A., and S.A. Yadoya Industria de Furadeiras are the most important Brazilian firms in this sector of the metal cutting equipment market.

Boring machines.—Domestic production of boring machines is insignificant; foreign manufacturers furnished nearly all the \$6 million worth of such machines purchased by end-users in 1972. Since Brazil is not expected to increase its output in this area, nearly all of the \$51 million worth of boring machines its industry is likely to buy in 1978 will have to be purchased abroad. The United States, which supplied 26% of the market in 1972, should be able to sell substantial quantities of combination type boring machines and horizontal boring machines. The 1978 market for these two items of equipment is forecast at \$6 million and \$23 million, respectively.

With a 19% share of the 1972 import market, Germany poses the only real competitive threat to American exporters of boring machines. Italy and Japan ranked a distant third and fourth, with market shares of 6% and 5% respectively. Calvi S.A. Industria e Comercio is the only Brazilian producer of boring machines.

Other sales opportunities.—Additional types of metalworking and finishing equipment that market researchers have identified as potentially strong sellers for American manufacturers exporting to Brazil include bending and forming machinery,

stamping presses, laminating presses, press brakes and dies, hammers and forging machinery, ingot molds, milling cutters, wire forming machinery, and parts and accessories for automatic lathes.

Demand for numerically controlled (NC) machine tools and machining centers is just beginning to develop in Brazil. Several importers have been vigorously promoting the sale of such equipment. As a result, the more technologically advanced end users—Bardella S.A., Industrias Mecanicas, Brown Boveri S.A., Caterpillar do Brasil S.A., Chrysler do Brasil S.A., Ford do Brasil S.A., Geral Motores do Brasil, and Volkswagen do Brasil S.A.—have begun to install this equipment. A leading domestic manufacturer, Industrias Romi S.A., now makes NC lathes and milling machines using imported controls.

While the NC market is seen as highly promising, the market for computer numerical controls (CNC) and direct numerical controls (DNC) is limited, as they are regarded as too costly and sophisticated for Brazil's needs during the present decade.

The market for electrical discharge machining equipment (EDM) and electrochemical machinery (ECM) is not yet well-defined. Most of the equipment presently in use has been imported from Switzerland. Although end-users have no immediate plans to place large orders for these types of equipment, market analysts believe that a significant demand will develop later in the 1970's.

Brazilian users of metalworking and finishing equipment are largely unaware of the range of possible applications for digital readout systems. Only

a few of these systems have been installed in Brazil and none are locally manufactured. Vigorous marketing efforts will be required to overcome the present lack of information and to generate enthusiasm among potential customers.

End-User Industries

The bulk of metalworking and finishing equipment consumed in Brazil is concentrated in the 13 industries listed in table 3. Composite sales of major end-users approximated \$9 billion in 1972 and are expected to increase at an average annual rate exceeding 14% through 1978, reaching about \$19 billion. In terms of sales, the largest end-users in 1972 were the iron and steel, motor vehicle, and home appliance industries. The three are expected to remain the major producers in 1978, recording sales in excess of \$10 billion.

The level of capital investment for the principal end-user industries has been cyclical in recent years, reaching a peak of \$5.4 billion in 1970 and dropping to \$5.1 billion in 1972. Trade sources estimate 1974 capital investment at \$10.7 billion and predict that it will exceed \$15 billion in 1978 (see table 4). As has been the case in the recent past, the biggest increases in capital investment during the 1974-78 period are likely to occur in the shipbuilding, aircraft, office equipment, iron and steel, tractor and off-road vehicles industries.

In the interest of stimulating the expansion and modernization of the nation's industry, the Brazilian Government has enacted a series of tax in-

Table 3.—Brazil: Principal end users of metalworking and finishing equipment, by industry, 1972
(values are in millions of U.S. dollars)

Industry	No. of manufacturers ¹	Value of sales ²	Value of capital investment ¹	No. of workers ²
Iron and steel	33	1,904	1,513	165,000
Miscellaneous metal- lurgical products	226	980	773	85,000
Motor vehicles	9	1,590	743	105,400
Industrial machinery, motors & equipment	136	548	561	50,290
Automotive parts	81	351	366	32,100
Home appliances, com- munications equipment	56	1,324	318	107,000
Nonferrous metals	31	729	291	106,760
Electrical equipment	46	187	191	17,120
Tractors, off-road vehicles and related equipment	25	282	126	18,600
Shipbuilding	14	234	113	15,600
Office machinery, equip- ment, and instruments	16	81	86	7,490
Railroad equipment	7	187	83	12,400
Aircraft and related equipment	7	304	35	4,650

¹ Data include only those firms having a net worth in excess of \$1 million.

² Data include all firms in the industry.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Brazilian trade source estimates.

Table 4.—Brazil: Value of capital investment of principal end-users of metalworking and finishing equipment by industry,¹ 1968, 1970, 1974 and 1978

(in millions of U.S. dollars)

Industry	1968	1970	1974	1978
Iron and steel	1,300	1,604	1,860	2,927
Miscellaneous metallurgical products	781	803	869	1,139
Motor vehicles	714	772	867	1,224
Industrial machinery, motors, and equipment..	537	581	643	874
Automotive parts	351	380	427	603
Home appliances, communications equipment	305	329	364	495
Nonferrous metals	298	301	321	405
Electrical equipment	189	198	215	282
Tractors, off-road vehicles, and related equipment	106	131	153	232
Shipbuilding	82	124	144	244
Office machinery, equipment, and instruments....	73	88	107	174
Railroad equipment	80	83	95	130
Aircraft and related equipment	22	39	45	75
Total	4,888	5,433	6,110	8,804

¹ Data includes only those firms having a net worth in excess of \$1 million.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Brazilian trade source estimates.

centives and concessionary financing programs available to buyers of machine tools and other industrial machinery and equipment. Some of these measures, such as the provision for accelerated depreciation, apply only to purchases of domestically produced capital goods. Many, however, also apply to investment in imported machinery and equipment that is not similar to that made in Brazil and to imported parts and accessories that complement domestically made machinery.

Firms may receive exemptions from or reductions of the Federal transaction tax (Tax on Industrialized Products—IPI) and states' sales taxes (Tax on Circulation of Merchandise—ICM). The IPI ranges from 5 to 12% on manufactured goods; the ICM in Sao Paulo State, where most industry is located, ranges from 13.5 to 15.5%. In the case of imported goods, these taxes are levied on the sum of the cost, insurance, and freight (c.i.f.) value plus the import duty. According to the Industrial Development Council (CDI), total tax exemptions and reductions granted in 1972 corresponded to 20% of Brazil's total expenditures on industrial machinery and equipment. These benefits were fairly evenly distributed among the major industrial sectors.

Public policies and investments affecting the four key areas in which Brazil's economic development

efforts are concentrated—communications, energy, mining, and transportation—should help boost MFE consumption in a number of user industry sectors. There are 10 sectors likely to be affected most strongly: motor vehicles and automotive parts; tractors and earth-moving equipment; metal forging and stamping; heavy industrial equipment; metalworking equipment; railroad equipment; shipbuilding; home appliances; metal pipes and fittings; and the bolts, screws, nuts, rivets, and washers sector.

Manufacturers of automotive vehicles and parts.—

This sector is by far the largest and technologically most sophisticated customer for both imported and domestically manufactured metalworking and finishing equipment. Brazilian automakers in 1973 produced an estimated 730,000 vehicles, 19% more than in 1972. Even so, car dealers have long waiting lists for many models, and truck manufacturers reported in December 1973 that they had already sold their entire 1974 production. To handle the pent-up domestic demand and, at the same time, supply the burgeoning export market, the industry has adopted plant expansion programs that could raise annual output to two million vehicles by 1980.

Car and truck manufacturers and the larger producers of automotive parts make extensive use of imported machine tools, especially metal cutting machinery. The choice of equipment is strongly influenced by the nationality of the firm's parent corporation. Although the auto industry purchases a wide variety of metalworking and finishing equipment, the following items are believed to have the greatest sales potential for the 1974-78 period:

- Automatic lathes
- Automatic milling machines
- Grinding machines
- Hydraulic presses
- Mechanical presses
- Milling machines
- NC machine tools

Major end-user firms and prospective customers in Brazil for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication Target Market Trade List, *Metalworking and Finishing Equipment—Brazil*, available for \$3 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230 or through your nearest District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications and trade associations.

Manufacturers of tractors and earthmoving equipment.—Shortages of parts and raw materials kept production from expanding by the 30 to 35% originally anticipated, yet the farm tractor industry was one of Brazil's fastest growing industries in 1973. Its output of 36,000 units represented an increase of 20% over the 1972 level. New investments are already being made in plant and equipment that could push production of wheeled tractors to 48,000 units by 1975 and 100,000 units by 1980.

Like their counterparts in the automotive industry, manufacturers of tractors prefer imported metalworking and finishing equipment in order to maintain high technical standards while producing on a mass scale. They are already making limited use of numerically controlled machine tools. The following imported equipment should be of particular interest to this industry sector during the next several years:

- Automatic lathes
- Automatic milling machines
- Grinding machines
- Milling machines
- Gear cutting machines
- NC machine tools

Manufacturers of metal forgings and stampings.—

The outlook for growth in this sector is bright, despite recent shortages and bottlenecks in the supply of raw materials. Manufacturers of forged parts and accessories are expanding their production facilities in anticipation of continued success in exporting such goods to Mexico, the United States, and the European Economic Community.

Brazilian manufacturers of metal forgings and stampings are only moderately advanced in regard to production technology. Although they may soon begin to introduce more automated procedures, their interest at present centers on basic equipment of the following types:

- Eccentric presses
- Friction presses
- Guillotine-type cutting machines
- Hammers and forging machines
- Bending and forming machines

Manufacturers of heavy industrial equipment.—

Manufacturers of machinery for steel mills, power plants, cement plants, and petrochemical complexes are experiencing rapid growth after a difficult period during which they were consistently outbid on large domestic projects by better-financed foreign suppliers. Since 1971, the National Bank for Economic Development's soft loan program and Brazil's general economic expansion have combined to raise industrial production in this sector by 13% in 1972 and 12% in 1973. Prospects for the future are bright and firms are already considering

capital investments that could amount to more than \$1 billion between now and 1980.

The technology employed by manufacturers of equipment for Brazil's basic industries is becoming increasingly complex. Substantial new investments in advanced metalworking equipment have been required to produce quality equipment that will help these basic industries compete with imported goods. The following types of metalworking equipment are reported to be of special interest to manufacturers of heavy industrial equipment:

- Turret lathes, universal type
- Vertical lathes
- Planers
- Radial drilling machines
- Hydraulic presses
- Bending and forming machines
- Universal milling machines
- Electrical discharge machining equipment
- NC machine tools

Manufacturers of metalworking equipment.—A

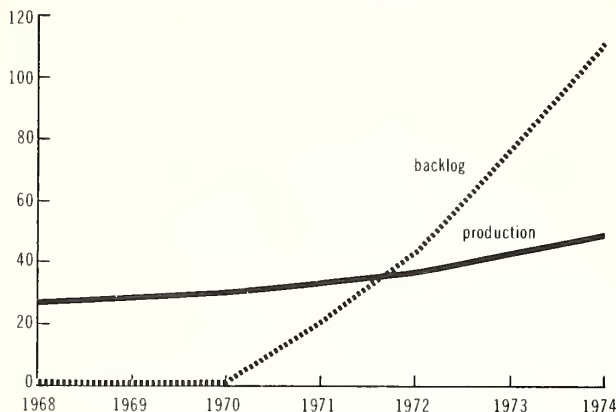
few of Brazil's leading manufacturers of metalworking equipment—particularly makers of lathes—have adopted advanced production methods and are introducing sophisticated equipment such as numerical controls. Most of the other producers use simple machines which, for the most part, are manufactured in-house. The tremendous demand for their products and the expected influx of foreign technology via licensing agreements and joint ventures, however, may improve the situation. During the next 4 years, Brazil's manufacturers of metalworking equipment are likely to be interested in buying the following types of equipment:

- Automatic lathes
- Copying lathes
- Universal milling machines
- Automatic milling machines
- Planers
- Radial drilling machines
- Multiple drilling machines
- Combination-type boring machines
- Cutting tools

Domestic Manufacture of Metalworking and Finishing Equipment

Brazilian manufacturers of metalworking and finishing equipment are making an unprecedented effort to supply the rapidly growing domestic market. The industry succeeded in raising its output by 11% in 1972 and by 13% in 1973. If, as has been predicted, production is boosted by an average of 14% per year during the next 5 years, 1978 output would exceed \$145 million compared with \$75 million in 1973. This is considered to be the industry's maximum sustainable growth rate, given the shortage of high-level technical personnel and

Figure 2.—Brazil: Machine tool production^{1/} and value of backlog held by local manufacturers, 1968-74
(in millions of U.S. dollars)



^{1/} Production data for alternate years.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Brazilian trade source estimates.

the bottlenecks in the supply of raw materials. Such an increase, however, would not be sufficient to arrest the decline in the industry's share of domestic metalworking and finishing equipment consumption. Brazilian MFE producers, who supplied slightly less than half of the country's requirements in 1968, met 36% of the 1972 needs and will probably supply about 10% of the 1978 market.

Output of lathes, the industry's most important product, exceeded \$14 million in 1972. Other equipment produced in large volume in that year included \$16 million worth of tools and dies for machine tools, \$9 million worth of eccentric presses, \$5 million worth of bending and forming machines, \$2.5 million worth of planers, and \$2 million worth of drilling machines.

Although they are finding it difficult to meet domestic needs, Brazilian manufacturers are exporting significant quantities of metalworking and finishing equipment, chiefly to other Latin American countries, including Mexico, Peru, Colombia, and Argentina. The equipment is attractively priced and its technological level is comparable with that of user industries in these developing nations. Exports totaled \$12 million in 1972 and are forecast at \$21 million for 1978. Best-selling equipment includes universal (horizontal) parallel lathes, stamping machines, accessories and parts for metal forming equipment, and press tools and dies.

Approximately 80 firms are engaged in the production of metalworking and finishing equipment in Brazil. With few exceptions, these are small and medium-size firms that make several different types of industrial equipment. The quality and technical sophistication of the equipment produced varies

considerably, and there is little opportunity to realize economies of scale.

Consolidation and rationalization measures now being considered by firms within the metalworking and finishing equipment industry may be of some benefit in expanding output and improving the quality of the equipment produced. Further progress in this direction will be made as domestic manufacturers obtain additional know-how through joint ventures, licensing and other technical agreements with foreign producers. At present, only four companies have made such arrangements.

Bardella S.A. Industrias Mecanicas makes mechanical and hydraulic presses under license from Komatsu, Ltd. (Japan), metal plate rolling machines and hydraulic bending machines of up to 1,200 tons under license from Bronx Engineering Co., Ltd. (U.K.), and both mechanical bending machines of 160-1,250 tons and guillotine-type cutting machines under license from Steelweld-Cleveland Crane (U.S.). Industrias Romi S.A. manufactures transfer machines under license from the W. F. & John Barnes division of Babcock & Wilcox (U.S.). Mahnke Industrial S.A. makes mechanical eccentric presses under license from Wilkins & Mitchell (U.K.), and Vigorelli do Brasil S.A. produces milling machines under license from Newall (U.K.).

Three of Brazil's manufacturers of metalworking and finishing equipment are subsidiaries of foreign—in all three cases, German—manufacturers. The Brazilian firms are B. Grob do Brasil S.A. (Ernst Grob Werkzeug und Maschinenfabrik), Pressas Schuler Ltda. (L. Schuler GmbH), and Traubomatic Industria e Comercio Ltda. (Traub GmbH).

Trade Regulations and Practices

Import duties applicable to metalworking and finishing equipment (BTN classifications 84.44, 84.45, 84.48, 84.50, and 85.11) range from 15 to 55% assessed on the c.i.f. value. The higher rates apply to types of equipment that have been declared to be similar to that produced in Brazil.

The following capital goods are often eligible for reduced duty or duty-free importation: Items imported to benefit public services; goods used to equip and expand Brazilian industries; products needed for development projects; and equipment imported by enterprises engaged in production for export.

Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4127, Main Commerce Building, Washington, D.C. 20230.

All imported metalworking and finishing equipment is subject to an import permit. Permits are

granted freely, however, since domestic production falls far short of meeting demand.

Orders for foreign-made metalworking and finishing equipment are handled primarily by one of a group of approximately 10 dealers and representatives, most of whom are headquartered in Sao Paulo. These firms owe their success to their ability to offer factory-authorized service and technical assistance. Market researchers report that nearly all of these dealers are interested in representing additional product lines, particularly of American-made metalworking and finishing equipment.

Technical Requirements

Standards applicable to industrial equipment intended for use in Brazil are administered by the Associacao Brasileira de Normas Tecnicas, Rua Marques de Itu 88, Sao Paulo, S.P., Brazil. U.S. standards are widely accepted.

The characteristics of Brazil's electrical power

supply are 120/220 volts, 60 hertz, 3-phase for light industrial use and 220/440 volts, 60 hertz, 3-phase for heavy industrial use. All electrical equipment must bear permanent labels describing its electrical characteristics.

The metric system of weights and measures is the statutory standard in Brazil. Published national standards for metalworking and finishing equipment in Brazil may be obtained through the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230:

"The Market for Metalworking and Finishing Equipment in Brazil," DIB 74-07-508, February 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Brazil. The table below gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by Brazil in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Brazil: Imports of metalworking and finishing equipment, 1968-78 alternate years

(in thousands of U.S. dollars)

Equipment	1968	1970	1972 ¹	1974	1976	1978
Metal Cutting Machine Tools:						
<i>Lathes</i>						
Bench type parallel (horizontal), universal	—	—	122	282	565	1,018
Parallel (horizontal), universal	—	—	711	1,637	3,275	5,895
Bench type	—	—	14	34	68	123
Any other	—	—	503	1,158	2,317	171
Horizontal with multiple spindles, weighing						
over 3,000 kg	—	—	146	336	673	1,212
Frontal or plate type, weighing up to 3,000 kg	—	—	21	48	97	175
Frontal or plate type, weighing over 3,000 kg	—	—	505	1,163	2,326	4,188
Automatic	—	—	4,043	9,299	18,599	33,479
Copying or duplicating	—	—	1,645	3,785	7,571	13,628
Vertical, weighing up to 3,000 kg	—	—	47	109	219	394
Vertical, weighing over 3,000 kg	—	—	2,129	4,897	9,795	17,632
Other, weighing up to 3,000 kg	—	—	358	824	1,648	2,966
Other, weighing over 3,000 kg	—	—	1,172	2,697	5,395	9,712
Total	5,037	5,449	11,416	26,269	52,548	90,593
<i>Milling machines</i>						
Automatic	—	—	2,551	5,867	11,734	21,122
Universal	—	—	2,351	5,408	10,816	19,469
Vertical, nonautomatic	—	—	559	1,287	2,574	4,634
Horizontal, nonautomatic	—	—	355	817	1,634	2,941
Other	—	—	4,333	9,966	19,933	35,880
Total	6,512	6,673	10,149	23,345	46,691	84,046
<i>Planers/Shapers</i>						
Shaper-planer, weighing up to 500 kg	—	—	—	—	4	7
Shaper-planer, weighing over 500 kg	—	—	12	29	59	106
Planer with table for simple translation						
movements up to 2,000 kg	—	—	11	27	54	98
Planer with table for simple translation movements,						
weighing over 2,000 kg	—	—	176	405	811	1,460
Shaper-planer with tilting table	—	—	17	39	79	142
Other, weighing up to 2,000 kg	—	—	21	49	98	176
Other, weighing over 2,000 kg	—	—	570	1,312	2,624	4,723
Total	983	327	807	1,861	3,729	6,712
<i>Drilling machines</i>						
Radial, weighing up to 2,000 kg	—	—	229	528	1,057	1,904
Radial, weighing over 2,000 kg	—	—	848	1,950	3,901	7,023
Bench type, weighing up to 1,000 kg	—	—	54	125	251	451
Bench type, weighing over 1,000 kg	—	—	71	163	327	589
Column type (with one or more columns), up						
to 1,000 kg	—	—	71	164	329	592
Column type (with one or more columns),						
over 1,000 kg	—	—	209	482	964	1,735
Multiple with multispindle headstock, up						
to 1,000 kg	—	—	28	65	131	237
Multiple with multispindle headstock,						
over 1,000 kg	—	—	583	1,342	2,685	4,833

¹ Brazil adopted Brussels Tariff Nomenclature and use of f.o.b. values in 1971; therefore, data for 1971 and thereafter are not strictly comparable with data for earlier years.

Equipment	1968	1970	1972 ¹	1974	1976	1978
Multiple with more than one mono or multispindle headstock, up to 1,000 kg	—	—	40	92	185	333
Multiple with more than one mono or multi-spindle headstock, over 1,000 kg	—	—	2,038	4,688	9,376	16,876
Other, weighing up to 1,000 kg	—	—	97	223	447	805
Other, weighing over 1,000 kg	—	—	1,016	2,337	4,675	8,415
Total	7,136	3,154	5,284	12,159	24,328	43,793
<i>Boring machines</i>						
Horizontal, universal	—	—	2,807	6,456	12,913	23,244
Vertical, honing, universal	—	—	65	150	300	541
Coordinates type	—	—	742	1,708	3,417	6,151
Multiple, weighing up to 1,000 kg	—	—	—	—	—	—
Multiple, weighing over 1,000 kg	—	—	295	680	1,361	2,450
Other, weighing up to 1,000 kg	—	—	55	127	254	458
Other, weighing over 1,000 kg	—	—	2,223	5,113	10,227	18,408
Total	—	—	6,187	14,234	28,472	51,252
<i>Broaching machines</i>						
Horizontal	—	—	30	69	139	251
Vertical	—	—	867	1,995	3,990	7,182
Rotational, for surfaces	—	—	—	—	—	—
Other	—	—	79	181	363	654
Total	493	164	976	2,245	4,492	8,087
<i>Slotting machines</i>	—	—	833	1,917	3,834	6,902
<i>Sawing machines</i>						
Endless band	—	—	179	413	827	1,490
Other band	—	—	4	9	19	35
Circular	—	—	613	1,410	2,820	5,076
Other	—	—	276	635	1,271	2,289
Total	264	392	1,072	2,467	4,937	8,890
<i>Threading Machines</i>						
Thread milling machines	—	—	796	1,832	3,665	6,598
Thread rolling machines	—	—	68	158	316	569
Total	307	270	864	1,990	3,981	7,167
<i>Gear cutting machines</i>	—	—	1,908	4,389	8,778	15,801
<i>Grinding and other sharpening machines</i>						
Saw sharpening machines	—	—	189	435	870	1,566
Universal grinding machines	—	—	1,014	2,334	4,668	8,403
Vertical grinding machines	—	—	442	1,019	2,035	3,663
Horizontal grinding machines	—	—	1,170	2,691	5,384	9,688
Centerless grinding machines	—	—	1,414	3,247	6,495	11,696
Gear grinding machines	—	—	383	882	1,765	3,177
Other grinding machines	—	—	9,119	20,974	41,950	75,510
Total	5,979	6,333	13,731	31,582	63,167	113,703
<i>Other Cutting Machines</i>						
Electroerosion cutting machines	—	—	585	1,346	2,693	4,848
Guillotine type	416	356	1,952	4,490	8,980	16,165
Other	4,487	1,647	6,923	15,923	31,846	57,323
Total	4,903	2,003	9,460	21,759	43,519	78,336
Total metal cutting machine tools	31,614	24,765	62,687	144,217	288,476	515,282
<i>Metal Forming Machine Tools</i>						
Stamping machines	4,854	2,854	15,262	35,103	70,206	126,371
Wire forming machinery	—	—	2,312	5,319	10,639	19,150
Hammers or forming machines	—	—	4,616	10,617	21,234	38,221
Bending and forming machines	—	—	6,743	15,509	31,019	55,835
Manual wiredrawing machines	—	—	110	253	506	912
Extrusion machinery	—	—	1,007	2,317	4,635	8,343
Wirestretching or drawing machines	—	—	1,760	4,048	8,096	14,573
Machines for winding, stretching, or drawing pipes	—	—	229	526	1,053	1,897
Other	3,888	4,509	4,196	9,651	19,303	34,746
Total	8,742	7,363	36,235	83,343	166,691	300,048

Equipment	1968	1970	1972 ¹	1974	1976	1978
<i>Other Metalworking Equipment:</i>						
Converters	63	—	105	243	486	876
Moulds for ingots	3	242	2,473	5,689	11,379	20,482
Laminating machines, including cylinders	4,904	7,720	11,978	27,549	55,099	99,178
Blowtorch for soldering and cutting	—	1	73	170	340	612
Machines for soldering or cutting, weighing up to 500 kg	—	—	222	511	1,022	1,840
Machines for soldering or cutting, weighing over 500 kg	—	—	195	449	899	1,618
Total	5,153	8,633	15,046	34,611	69,225	124,606
<i>Accessories and Parts for Machine Tools:</i>						
Lathe chucks	—	71	220	507	1,015	1,827
For lathes	—	—	4,400	10,125	20,255	36,462
For milling machines	—	—	1,145	2,635	5,270	9,486
For planers	—	—	100	208	417	751
For drilling machines	—	—	315	726	1,453	2,616
For boring machines	—	—	521	1,199	2,399	2,159
For broaching machines	—	—	120	276	553	996
For slotting machines	—	—	32	75	151	272
For sawing machines and circular cutting tools	—	—	82	190	381	687
For thread rolling and thread milling machines	—	—	111	256	512	923
For grinding machines	—	—	1,505	3,466	6,933	12,482
For electroerosion cutting machines	—	—	47	108	216	389
For stamping machines	—	—	542	1,246	2,493	4,488
For wire-drawing machines	—	—	9	21	43	77
For extrusion machinery	—	—	114	262	525	945
For other machine tools	1,305	2,540	3,010	6,927	13,861	24,954
Total	1,305	2,611	12,273	28,227	56,477	99,514
<i>Perishable Tools and Dies:</i>						
Blades for circular saws and bandsaws, for metal cutting	864	1,144	1,125	2,588	5,176	9,317
Press tools and dies	1,567	2,334	6,019	13,844	27,689	49,841
Drills	851	1,330	1,118	2,571	5,143	9,258
Threading tools	778	243	1,849	4,253	8,507	15,313
Wire-drawing dies for extrusion type presses	—	—	135	311	623	1,121
Broaches	—	—	65	150	301	543
Milling cutters	1,806	1,539	1,692	3,891	7,782	14,009
Planer tools	1,377	2,538	2,498	5,747	11,495	20,692
Sintered metal carbide tool tips	153	384	178	410	820	1,477
Total	6,676	9,512	14,679	33,765	67,536	121,571
<i>Metal Finishing Equipment:</i>						
Abrasive wheels for metal deburring equipment	415	1,936	632	1,454	2,909	5,237
Gear finishing machine, except for the abrasive type ..	—	—	173	397	75	1,432
Bench type polishing machine	—	—	103	237	474	853
Manual tools for face hardening	—	—	19	44	89	160
Other face hardening equipment	—	—	188	433	866	1,559
Total	415	1,936	1,115	2,565	5,133	9,241
Total metalworking and finishing equipment	53,905	54,820	142,035	326,728	653,538	1,170,262

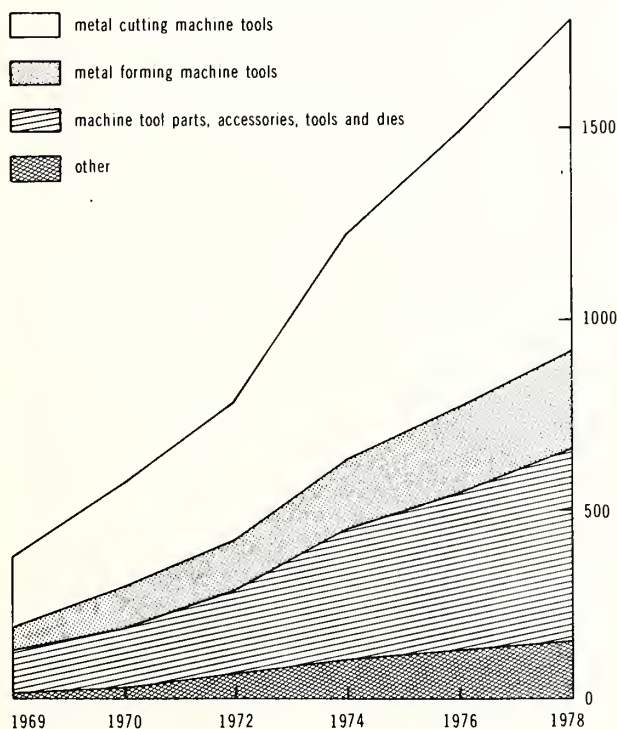
Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Brazilian trade source estimates.

France

Business and industrial activities in France are proceeding briskly in the face of shortages of fuels and several key raw materials. Most capital investment projects are going forward as planned, despite widespread uncertainty concerning the anti-inflationary measures likely to be taken by the new government. Preliminary data suggest a 4 to 4.5% rise in the country's gross national product (GNP) for 1974, compared with the 6.6% achieved in 1973.¹ This increase, although lower than that of previous years, is considered by economists to be highly respectable in view of present conditions.

Figure 1. — France--Consumption of metalworking equipment, 1969 and 1970-78, alternate years.

(in millions of U.S. dollars)



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on French trade source estimates.

Industrial plants in most sectors are operating at full capacity. As manufacturers strive to boost output, sophisticated mechanical and electrical equipment of all kinds, including metalworking and finishing equipment (MFE), is in high demand. The need to expand production facilities is particularly acute among producers of steel and agricultural machinery.

Consumption of metalworking equipment in 1974 is estimated to be worth \$1.2 billion, or 55% more than the \$775 million purchased in 1972 (see table 1). The market for 1978 is forecast at nearly \$1.8 billion, reflecting the 10% average annual growth rate expected to prevail during the 1974-78 period. Market expansion for MFE in 1972-74 was on the order of 15%.

Rising interest in numerically controlled (NC) equipment is expected to generate an 11% annual growth rate in French spending for metal cutting machine tools, boosting consumption from \$582 million to nearly \$875 million during the 1974-78 period. Purchases of metal forming machine tools may climb from \$184 million to more than \$250 million during the same period. This survey focuses discussion on these two product subcategories, since data on the market for metal finishing equipment are not available.

Estimates indicate that France is importing 42%, or \$510 million, of its 1974 purchases of metalworking and finishing equipment (see Appendix).

¹In order to present a more accurate picture, growth rates have been calculated from local currency values. This eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	Fr/U.S. \$1.00
1969	5.558
1970	5.520
1972	5.125
1973-78	4.267

While imports should approach \$700 million in 1978, foreign suppliers may experience a slight decline in their share of the market if official efforts to persuade industry to "buy national" prove successful.

France bought \$23 million worth of metalworking equipment from the United States in 1972 (see table 2). American exporters should be able to increase their share to \$42 million by 1976 if they take advantage of French industry's growing need for numerically controlled and other specialized machine tools.

Germany, which held a 1972 import market share of 47%, is France's leading supplier of metalworking equipment. German exporters offer a wide variety of both NC and standard machinery. Long-standing ties with French end-users, combined with liberal credit terms, have enabled Germany to maintain its predominant lead in this market, notwithstanding increases in machinery prices.

Improvements in the quality of steel used in its machine tools helped Italy win a 12% share of the 1972 French MFE import market and place second to Germany in that market. The position of Italian manufacturers is severely threatened, however, by Italy's industrial unrest and its effect on delivery schedules.

Switzerland and the United Kingdom ranked third and fourth in the import market in 1972, with shares of 10% and 7%, respectively. British manufacturers represent a serious threat to American exporters of metalworking equipment since they market sophisticated NC machining centers and other equipment in direct competition with U.S. firms. Moreover, tariff rates on imports from the United Kingdom will be abolished in mid-1977 when Britain emerges from the transitional phase of its membership in the European Economic Community. Depending on the relationship between the respective currencies, imports from the United Kingdom could increase 15 to 25% between 1974 and 1978.

Leading supplier nations' shares of the import market for each product subcategory (i.e., metal cutting machine tools; metal forming machine tools; and parts, accessories, and tools and dies for machine tools) generally correspond to their shares of the import market for the product category as a whole. American manufacturers nevertheless have a significant advantage in supplying sophisticated nu-

Table 1.—France: Consumption¹ of metalworking equipment, 1969, 1972, 1974, and 1978
(in millions of U.S. dollars)

Year	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories, tools and dies	Other	Total
1969					
Production	175.1	59.4	99.9	18.0	352.4
Imports	79.6	29.1	49.0	12.5	170.2
Exports	62.7	29.0	35.6	10.1	137.4
Consumption	192.0	59.5	113.3	20.4	385.2
1972					
Production	279.6	86.0	188.3	63.4	617.3
Imports	163.7	64.7	95.4	29.2	353.0
Exports	84.8	26.1	57.2	24.6	192.7
Consumption	358.5	124.6	226.5	68.0	777.6
1974					
Production	468.0	143.0	295.0	98.0	1,004.0
Imports	245.0	91.0	134.0	40.0	510.0
Exports	131.0	50.0	85.0	34.0	300.0
Consumption	582.0	184.0	344.0	104.0	1,214.0
1978					
Production	728.0	225.0	460.0	145.0	1,558.0
Imports	343.0	118.0	176.0	55.0	692.0
Exports	197.0	92.0	127.0	43.0	459.0
Consumption	874.0	251.0	509.0	157.0	1,791.0

¹ Consumption equals production plus imports less exports.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and French trade source estimates.

merically controlled machine tools in 1972. France obtained approximately 20% of its imported NC metal cutting equipment and 60% of its foreign-made NC metal forming equipment from the United States. It is apparent, then, that U.S. exporters should concentrate their market development efforts on these advanced, and specialized machine tools.

Sales Opportunities

A market research survey recently conducted in France for the U.S. Department of Commerce, Office of International Marketing, identified several types of metalworking equipment as offering particularly good sales opportunities for American exporters.

Numerically controlled machine tools.—French purchases of NC machine tools are expected to quadruple between 1972 and 1978, totaling \$140 million in the latter year. Imports could soar from \$9 million to \$60 million within the same period. U.S. suppliers should be able to capture 25% of the import market for the more sophisticated models of NC milling machines and machining centers and up to 75% of the market for NC forming machinery.

A survey taken in France at the end of 1972 revealed 1,500 installations of numerically controlled machine tools. Trade sources predict that 3,200 such machines will be in place by the end of 1975. The following table illustrates the pattern of sales for the various types of point-to-point and continuous-path equipment in 1972:

Machine Type	Number in place, 1972	1972 Sales in units	
		Point- to-point	Continuous path
Milling	510	20	36
Drilling, drilling-boring	285	24	1
Center lathes	255	4	28
Machining centers	225	16	12
Boring and boring- milling	90	8	3
Metal forming	75	8	0
Vertical boring-turning	60	—	9
Total	1,500	80	89

Buyer interest centers almost exclusively on the simpler types of NC equipment; few customers are convinced that the potential advantages of computer numerical controls (CNC) and direct numerical controls (DNC) could justify the higher price tags. Sales of numerical controls for retrofitting are also modest; market analysts estimate that these total \$2.5 to \$5 million annually.

In order to encourage industry to equip itself with NC and other advanced types of machine tools, the French Government, in cooperation with the Syndicat Francais des Constructeurs de Machines-Outils (SCFMO—the principal French trade asso-

France—Age of metalworking equipment currently in use

Age of Equipment	Percent
Less than 5 years old	10
5 to 15 years old	50
Over 15 years old	40
Total	100

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

ciation), developed a program to finance the purchase of NC equipment on a 2-year trial basis. Under the so-called '100 Machines Plan, both the domestic manufacturer and the prospective user receive loans which provide for the installation of the equipment in the user's plant at almost no financial risk to either party. The customer has 2 years in which to study the effectiveness of the equipment in his own production operations and decide whether to purchase it. This program, however, does not apply to imported machinery.

Germany and the United Kingdom are the United States' principal foreign competitors in the French market for NC machine tools. Prominent German supplier firms include Carl Hasse & Wrede, GmbH, Fritz Werner, GmbH, VDF, and Max Muller. The United Kingdom is represented chiefly by the British subsidiaries of two U.S.-based firms, Kearney & Trecker and Cincinnati Milling Machine Co. The Austrian firm, Voest-Vereinigte Osterreichische Eisen-und-Stahlwerke, is also supplying NC machines to the French market.

Leading French makers of NC machine tools include Renault Machines-Outils, Cit-Alcatel-Graffenstaden, Gambin S.A., Hure S.A., Line-G.S.P., Rattier-Forest S.A., Societe d'Applications Generale d'Electricite et de Mecanique (SAGEM), and Sundstrand-France.

French end-users are primarily interested in buying:

- NC milling machines
- NC drilling-boring machines
- NC center lathes
- NC machining centers
- NC forming machinery

French imports of NC drilling machines rose by 170% between 1969 and 1972, while imports of NC milling and NC grinding machines nearly tripled. Milling machines accounted for approximately 30% of the NC machine tools installed in France in 1972; center lathes and machining centers accounted for an additional 30%; and drilling and boring machines accounted for 20%. The remainder consisted of roll forming and other NC metalworking equipment.

Grinding machines.—The French market for

Table 2.—France: Imports of metalworking equipment by country, 1972
(in millions of U.S. dollars)

Equipment	Germany	Italy	Switzer- land	United Kingdom	U.S.	Other	Total
Metal cutting machine tools	72.1	22.9	19.9	12.2	9.8	26.8	163.7
Metal forming machine tools	31.3	7.7	3.2	3.6	5.3	13.6	64.7
Subtotal, metalworking equipment	103.4	30.6	23.1	15.8	15.1	40.4	228.4
Machine tool parts, dies, etc.	46.4	6.3	9.9	6.8	7.1	18.9	95.4
Other	15.0	4.4	3.0	1.3	1.1	4.4	29.2
Total	164.8	41.3	36.0	23.9	23.3	63.7	353.0

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics.

grinding machines in 1978 is expected to total \$130 million, more than double the estimated \$60 million market for 1972. Since domestic manufacturers are weak in this sector, it is anticipated that French industry will continue to purchase two-thirds of its grinding machines from foreign suppliers. Constructions de Clichy S.A., Ernault-Somua, and Cincinnati Milacron are the only major domestic producers of grinding machines.

Although the U.S. share of grinding machine imports in 1972 was less than 5%, or about \$2 million, user-industry demands for more accurate equipment will provide new opportunities for the introduction of advanced American technology. Sales could reach \$7 million, or 10% of imports, in 1978. Strong resistance to stepped-up U.S. sales efforts will be offered by well-established European competitors. These include Newall Group Sales and Jones & Shipman (United Kingdom); Kellenberger and Tripet (Switzerland); Petewe and Kerstens (Germany); and Chiringhelli and Zocca (Italy).

High demand is foreseen for the following types of grinding machines:

- NC grinding machines
- Centerless external grinding machines
- External plunge grinding machines
- Abrasive belt grinding machines

Gear cutting machines.—French industry depends heavily on foreign manufacturers to meet its needs for gear cutting machines. In 1972, imports totaled \$6 million, of which domestic producers such as Durand, Ateliers G.S.P., and Rollet, supplied only an estimated \$1 to \$2 million. The 1978 market is forecast at \$13 million, with imports likely to reach \$11 million.

American-made gear cutting machines are solidly accepted among French end-users, a fact which gives U.S. exporters a firm base on which to build an increased market share. Even without improving their relative position in the market (now a 20% share of imports), American manufacturers could post sales of \$2.5 million in 1978.

German firms, including Carl Hurth Maschinen- und Zahnradfabrik, Klingelberg, and Lorenz, as well as Swiss companies such as Wyssbrod, Wahli, and Mikron are also well established in this market.

Of particular interest to French end-users are the following types of gear-cutting machines:

- Gear shaving and grinding machines
- Gear tooth chamfering and rounding
- Gear and spline hobbing machines
- Spur and helical gear hobbing machines
- Worm gear hobbing machines
- Rack cutting machines

Automatic turning machines.—French outlays for automatic turning machines amounted to \$40 million in 1972, and over 50% of this sum was spent for foreign-made equipment. Imports should continue to account for a major share of this market, representing \$40 million of probable 1978 purchases of \$70 million. Assuming that the U.S. share of imports remains stable at its present level of 7.6%, U.S. sales will reach \$3 million in 1978, compared with \$1 million in 1972.

Since potential customers already have expressed interest in becoming better acquainted with American-made automatic turning machines, greater promotional efforts should generate additional sales. However, representatives of German, Swiss, and British firms are in a position to compete aggressively in this market. Major European suppliers of automatic turning machines to France include Pittler, Gildemeister AG, and Schutte (Germany); Colchester, Vaughan, and Hardinge (United Kingdom); and Kummer and Oerlikon (Switzerland). Leading domestic manufacturers include Ernault-Somua, Ramo, Amtec, Cazeneuve S.A., Berthiez, and Manurhin-Tarex. Customer interest centers on:

- Special-purpose automatics
- Multispindle bar automatics

Special forming machines.—French spending for special forming machine equipment, placed at \$78 million in 1972, may pass the \$140 million mark in 1978. Imports normally account for approximately half the total purchases. Sales by American firms reached \$4 million in 1972; by contrast, Germany and Italy together posted sales of nearly \$40 million. The best-known German special forming machines are those manufactured by Becker & Van Huellen, Lindemann, and Weingarten. U.S. experience in making special presses for the motor vehicle and aircraft industries should help American ex-

porters win a greater share of the market for special forming machines.

Types of forming machines likely to sell well include the following:

- Presses
- Swaging machines
- Punching and shearing machines

Quite a few French companies make punching and shearing machines; Jambon, Sirugue, Somenor, and Vernet are a few of the more prominent names on the list. Only two firms, Spiertz and Morane-Somua, make large presses. Swaging machines are produced by both Jambon and Olier.

Other sales opportunities.—Market analysts have identified a number of other types of metalworking equipment as potentially strong sellers for U.S. manufacturers; these include:

- Drilling machines
- Sawing, filing, and cut-off machines
- Wire forming machines
- Milling machines
- Turning machines, special-purpose lathes
- Planing, shaping, and slotting machines
- Electrical discharge and chemical machining machines
- Thread rolling machines
- Transfer and unit head machines

French user industries have begun to invest in basic models of digital readout systems. Consumption has been estimated at \$4.5 million annually. The large number of suppliers in the market makes for very stiff competition on the basis of price.

Imports of electrical discharge machining (EDM) equipment have been increasing steadily. Shipments from foreign suppliers, chiefly Swiss, rose from 130 units in 1969 to nearly 200 units in 1972, while domestic production fell off sharply. Continued strong demand for EDM equipment used in special tooling applications is expected to boost imports by as much as 20% annually through 1978.

Electrochemical machining (ECM) equipment is utilized in France primarily in the manufacture of jet engines and turbine parts and blades. Domestic ECM production is insignificant. Imports, mainly from Germany, ranged from 15 to 30 machines annually during 1970-72. Market analysts suggest that imports may climb by 5 to 10% annually through 1978.

End-User Industries

Leading user industries of metalworking equipment in France reported sales of \$41 billion in 1970, compared with \$26 billion in 1965, reflecting an average yearly growth of just over 12% (see table 3). Capital investment rose by 14% per year during the same period. Declines in employment in the iron, steel, and nonferrous metals industries were barely offset by increases in the work force in other industries; combined employment for the user industry rose by only 1.6% on an annual basis.

Table 3.—France: Principal end-users of metalworking and finishing equipment, by industry, 1970
(in millions of U.S. dollars)

Industry	Value of sales	Value of capital expenditures	No. of workers
Motor vehicles and cycles	6,324	811	354,000
Mechanical equipment	14,283	700	860,000
Iron and steel	3,880	587	177,000
Electrical equipment	5,909	503	401,000
Primary metal products	7,640	431	504,000
Defense and aerospace	1,846	217	153,000
Nonferrous metals	1,045	155	30,000

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics.

The Government's Sixth Plan, which maps the nation's economic growth for the 1971-75 period, gives the following projections for average annual increases in production and capital expenditures by four key industries using metalworking equipment. Except for rates given for the highly volatile aerospace industry, the forecast is also considered to be valid for the 1976-78 period.

Projected 1970-75 Annual Growth Rates

Industry	Production (percent)	Capital expenditures (percent)
Motor vehicles and cycles	8	9
Mechanical equipment	8	9
Aerospace	8	25
Electrical equipment	9	7

In comparison, the output of French industry as a whole is expected to rise by 7.4% annually between 1972 and 1978, while capital expenditures may climb by an average of 6.7% per year.

Motor vehicles.—The automotive industry is France's principal user of machine tools; plant facilities are modern and well equipped. The industry's metalworking equipment purchases were estimated at \$175 million in 1972, and investments could climb to \$350 million in 1978—an average increase of 14.5% per year.

The industry produced 3.3 million motor vehicles in 1972. Sales, including parts and accessories, totaled \$34 billion, and exports absorbed nearly 60% of output. The top three firms (Renault, Peugeot, and Citroen) alone invested \$338 million in capital equipment in 1972.

Manufacturers are primarily interested in purchasing:

- Gear cutting machines
- Presses

Major end-user firms and prospective customers in France for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, *Target Market Trade List, Metalworking and Finishing Equipment—France*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

- Grinding machines
- NC grinding centers

Mechanical equipment.—The industry includes producers of construction, mining, materials handling and metalworking equipment; agricultural machinery; railway rolling stock; machinery for the chemical, plastics, and food industries; refrigeration equipment; pumps and compressors, and textile machinery. Sales of such equipment in 1972 were estimated at \$19 billion, compared with \$14 billion in 1970. Capital expenditures by the industry could total as much as \$1.6 billion in 1978. Firms in the industry are likely to purchase the following types of metalworking equipment from American suppliers:

- Gear cutting machinery
- Grinding machines
- NC machine tools
- NC machining centers
- Special-purpose lathes

Aviation equipment.—The French reputation for excellence in the manufacture of aerospace equipment for both civilian and military use has always been a source of national pride. The "Caravelle" passenger jet and the "Mirage" jet fighter, for example, have had enormous international success. Industry requirements for MFE are clouded, however, by the uncertain outcome of the "Concorde" project.

The three leading French aerospace firms spent \$248 million for capital goods in 1972; of this amount, approximately \$82 million went for metalworking and finishing equipment. Interest in U.S.-made machinery usually arises concomitantly with manufacturers' requirements for high accuracy or special capability equipment. Of particular interest to the aerospace industry are U.S.-made:

- Gear cutting machines
- NC machining centers
- Presses
- Grinding machines
- ECM

Electrical and electronic equipment.—This sector

includes France's fast-growing electronic data processing and telecommunications manufacturers as well as appliance and heavy electrical machinery producers. Combined output of the industry was \$7.8 billion in 1972, compared with \$5.9 billion in 1970. During that 2-year period, capital expenditures rose from \$503 million to \$585 million.

The industry's technological level can be characterized as only moderately advanced. It is difficult for France to compete with Germany and Italy with regard to heavy electrical goods. On the other hand, French manufacturers are very successful in exporting small electric appliances, such as food mixers, blenders, and grinders.

French producers of electrical and electronic equipment are interested in buying American-made:

- Gear cutting machines
- NC machine tools
- Machining centers
- Special-purpose lathes

Domestic Manufacture of Metalworking and Finishing Equipment

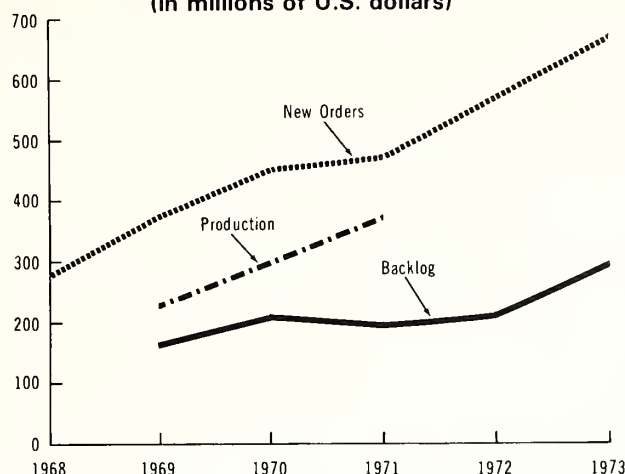
French output of metalworking equipment has increased by more than 15% annually from its 1972 level to an estimated amount in excess of \$1 billion in 1974. Production is expected to rise by nearly 12% annually during the 1974-78 period.

France continues to import nearly 50% of the machine tools its industries require; domestic manufacturers are nevertheless making substantial improvements in some of their product lines. French firms hope to be able to compete on a more equal footing with foreign manufacturers of such items as standard lathes, boring, drilling and milling machines, press brakes, and hydraulic presses. Government policy is designed to strengthen the industry by promoting consolidation of companies into more viable corporate groups employing at least 500 workers. The merger of Ratier-Forest and Line-G.S.P. is an example of this policy. In 1972, 12 corporations generated almost 45% of sales.

French MFE producers are building a reputation as makers of quality NC equipment. Ratier-Forest's V3.1250 machining center is typical of the industry's more advanced equipment. This machine, a fixed table, gantry type, employs three vertical heads that provide spindle speeds of from 0 to 4,000 mm/minute. The bulk of the NC equipment made in France, however, consists of knee- and bed-type milling machines, planer type milling machines, and vertical boring and turning machines.

French exports of metalworking equipment are climbing rapidly; they rose by nearly 14% per year between 1972 and 1974. Sales abroad are likely to increase at the more moderate pace of 11% annually during the next few years, probably exceeding \$450 million in 1978 as compared with an

Figure 2. France- Machine tool production, new orders and value of backlog held by local manufacturers, 1969-73
(in millions of U.S. dollars)



Source: U.S. Department of Commerce, Bureau of International Commerce, market research study.

estimated \$300 million in 1974. Metal forming equipment, such as hydraulic and mechanical presses, pipe and sheet bending machines, and punching and shearing machines, are said to be in particularly strong demand in export markets.

Most firms in the French MFE industry are relatively small, family-owned enterprises; for example, in 1972, 139 of the 199 manufacturers had fewer than 100 employees. These companies were responsible for less than 20% of sales.

One of the biggest companies in the industry is Ernault-Somua, which is affiliated with Schneider, a major European, heavy-industry holding company. Ernault-Somua, with 3,500 employees, specializes in the manufacture of lathes and also makes milling machines (including NC vertical milling machines for point-to-point paraxial or contouring), milling and boring machines, machining centers, grinding machines, cut-off machines, and drilling and boring machines. The company reported 1972 sales of \$53 million.

Renault Machines-Outils employed 2,000 workers and had sales of \$29 million in 1972. Much of Renault's equipment is specifically designed for use by the motor vehicle industry. For example, transfer lines for cylinder block machining are among the firm's best-known products. Renault also makes sliding lathes, bar automatics, milling and boring machines, and sheet and plate shearing machines.

Hure S.A., France's leading maker of milling machines, had 1972 sales of nearly \$20 million. Hure exports approximately one-half of its production.

Ratie Forest S.A., with 1,300 employees and 1972 sales of almost \$20 million, makes NC ma-

chine tools, machining centers, drilling machines, boring machines, planing machines, milling machines, and milling and boring machines.

Only a few subsidiaries of foreign manufacturers make metalworking and finishing equipment in France. None of the subsidiaries ranks among the industry's more important producers except for the E. W. Bliss Company, a subsidiary of Gulf-Western (United States), a leading manufacturer of mechanical presses. Amtec France S.A., a subsidiary of Litton Industries (United States), makes bar lathes, fine boring machines, and tapping machines. Landis-Gendron S.A., another Litton subsidiary, employs 600 workers making grinding machines. Cincinnati Chomienne S.A., a subsidiary of Cincinnati Milacron, Inc. (United States), employs 350 people and makes drilling, shaping, slotting, tapping, and grinding machines. Ateliers Stokvis S.A., a subsidiary of R. S. Stokvis & Zonen (Netherlands), is both a leading importer and a medium-size manufacturer of lathes, threading machines, and honing and lapping machines.

Trade Regulations and Practices

The import duties applicable to shipments of metalworking and finishing equipment from the United States range from 2.5 to 11%. Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4127, Main Commerce Building, Washington, D.C. 20230.

Most foreign MFE manufacturers are represented in France by one of the 75 to 100 import agents that deal in such equipment; a half-dozen firms, however, handle the bulk of the business. Very few foreign suppliers maintain sales offices in France.

The characteristics of France's electrical supply are 220/380 volts, 50 hertz, 3-phase. Wires and plugs must meet international GIC/DIN standards.

The metric system of weights and measures is the statutory standard in France.

Technical standards applicable to machine tools are administered by Syndicat Francais des Constructeurs de Machines-Outils (SCFMO) and by the Association Francaise de Normalisation (AFNOR). U.S. metalworking and finishing equipment normally meets these standards.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230: "The Market for Metalworking and Finishing Equipment in France," DIB 74-07-500, March 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in France. The table gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by France in 1969, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

France: Imports of metalworking and finishing equipment, 1969 and 1970-78, alternate years

(in millions of U.S. dollars)

	1969	1970	1972	1974	1976	1978
<i>Metal cutting</i>						
Automatic lathes, program controlled	2.6	4.8	4.5	9	13	18
Center drive lathes	n.a.	6.1	7.4	11	12	14
Sliding, surfacing, and screw cutting lathes	4.1	—	—			
Semiautomatic lathes	1.0	1.6	1.5	2	2	3
Automatic lathes, others	5.0	7.2	7.8	11	12	15
Multispindle automatic lathes	5.8	9.9	13.9	20	22	26
Lathes, others	0.9	1.5	2.1	3	4	4
Vertical boring and turning mills	1.5	3.1	5.2	7	8	10
Boring mills, program controlled	0.6	0.8	0.9	3	5	6
Boring and boring-milling machines	2.8	7.3	8.5	12	15	16
Planing, shaping, slotting and broaching machines	0.8	0.4	1.9	3	3	4
Sawing, filing, and cutting off machines	2.9	4.1	5.2	7	9	10
Broaching and slotting machines n.e.s.	1.8	3.8	4.3	6	7	8
Milling machines, program controlled	1.8	2.6	7.4	13	17	21
Drilling machines, program controlled	1.3	3.2	3.7	7	10	13
Milling machines n.e.s.	8.9	14.5	15.3	22	25	28
Radial drilling machines	1.3	1.3	1.8	3	3	3
Drilling machines, others	4.6	14.3	15.3	22	25	28
Grinding machines, program controlled	0.3	0.6	1.2	4	6	8
Grinding machines, others	18.9	28.9	37.4	53	61	70
Polishing, honing, lapping, and deburring machines	2.5	3.5	5.6	8	9	11
Jig boring machines, program controlled	0.8	0.9	1.2	3	4	6
Jig boring machines, others	1.2	1.8	1.7	2	3	3
Gear cutting machines	5.3	6.6	5.5	8	9	10
Threading and lapping machines	1.4	1.5	1.6	2	3	3
Other metal cutting machine tools	1.5	2.5	2.8	4	4	5
Total	79.6	132.8	163.7	245	291	343
<i>Metal forming</i>						
Hydraulic presses	3.6	7.0	5.6	8	9	10
Mechanical presses	11.6	21.8	22.5	31	35	40
Roll forming machines, program controlled	0.6	0.5	1.2	3	4	6
Pipe and sheet bending machines	2.2	3.5	4.8	7	8	8
Bar and tube bending machines	1.0	1.2	1.9	3	3	4
Punching and shearing machines	3.5	5.7	8.3	11	13	15
Forging and stamping machines	1.8	4.0	6.3	9	10	11
Mechanical wire drawing, bending, spring coiling, etc.	2.7	4.7	8.8	12	14	15
Mechanical swaging, riveting, metal container making, etc., machines	0.7	1.2	2.9	4	4	5
Other metal forming machine tools	1.4	2.7	2.4	3	4	4
Total	29.1	52.3	64.7	91	104	118
<i>Parts, accessories, tools, and dies</i>						
Machine vises, chucks, and tool holders	6.3	9.1	9.2	13	14	16
Accessories and parts for MT	14.4	25.4	41.2	57	65	72

**France: Imports of metalworking and finishing equipment, 1969 and 1970-78,
alternate years—Continued**

(in millions of U.S. dollars)

	1969	1970	1972	1974	1976	1978
Blades for circular saws, metal cutting	0.5	0.7	1.0	1	2	2
Metal cutting handsaws and other blades	1.8	2.5	2.6	4	4	5
Twist drills	4.7	5.4	7.0	10	12	14
Files, reamers, etc.	3.2	4.4	5.6	8	9	11
Milling cutters	0.7	0.7	0.8	1	1	2
Shapers	0.5	0.8	1.1	1	2	2
Threading dies and laps	1.9	2.5	2.6	4	4	5
Press tools and dies	1.3	8.0	2.3	3	4	4
Sintered metal carbide tools	8.2	10.6	13.8	20	24	27
Diamond tipped tools	1.1	1.2	2.1	3	4	4
Other tools for MT	4.4	7.8	6.1	9	10	12
Total	49.0	79.1	95.4	134	155	176
<i>Other metalworking equipment</i>						
Electrochemical and electric-discharge machinery equipment and ultrasonic machine tools	1.8	2.1	3.3	5	7	8
Metal diecasting machinery	1.7	3.0	3.9	5	6	7
Other casting equipment and machinery	4.9	7.9	13.5	19	22	25
Moulding boxes and moulds	0.8	2.0	3.2	4	5	6
Miscellaneous machines inadequately described..	3.3	5.4	5.3	7	8	9
Total	12.5	20.4	29.2	40	48	55
Grand total	170.2	284.6	353.0	510	598	692

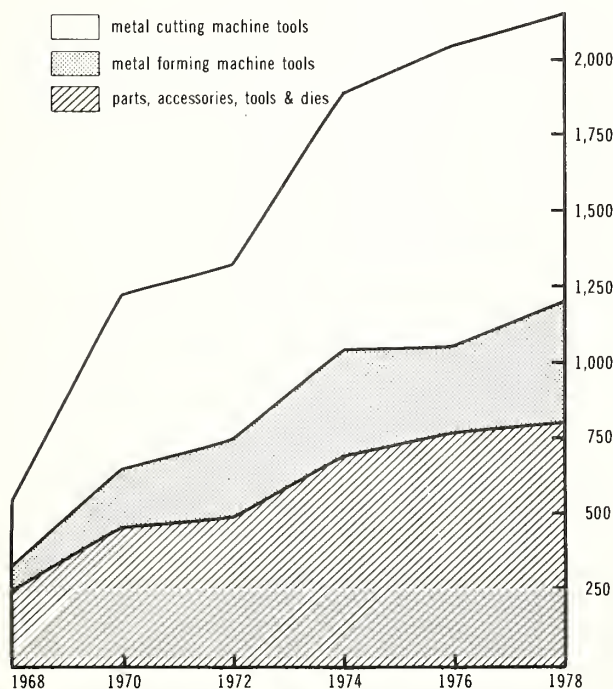
Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Value based on official trade statistics and French trade source estimates.

Germany

The German market for metalworking and finishing equipment (MFE), one of the world's largest for such machinery, is expected to show modest growth during the remainder of the 1970's. The impact of higher petroleum prices on an economy already operating under government-imposed anti-inflationary restraints could hold gross national product (GNP) growth below the 3% originally forecast for 1974. The prospects for sales of both domestic and imported capital equipment during the 1975-78 period may improve, however, with the recent decision to repeal some of the anti-expansionary measures such as an 11% investment tax.

Figure 1:--Germany: Consumption of metalworking equipment, 1968-78, alternate years.

(in millions of U.S. dollars)



Source: U. S. Department of Commerce, Bureau of International Commerce market research study. Values based on German trade source estimates.

German industry investment in metalworking equipment in 1978 is forecast at \$2.2 billion, reflecting an average annual increase of 4%¹ over estimated purchases of \$1.9 billion in 1974 (see table 1). This forecast is supported by domestic manufacturers of metalworking equipment, who expect new orders to climb by at least 5% annually through 1978. The market underwent rapid expansion during the years immediately following the 1967 recession; consumption consequently more than doubled between 1968 and 1970. Spending declined slightly between 1970 and 1972, then recovered to show an average increase of 3% per year during the 1972-74 period. The MFE market generally reflected the typical 4-year German business cycle, which experienced peaks in 1969 and 1973. An estimated 80% of German MFE is less than 15 years old, while about 50% is less than 10 years old. While it is not believed that a major equipment replacement cycle will take place during the 1974-78 period, market growth likely will result from industrial expansion.

Purchases of metal cutting machine tools, which totaled \$578 million in 1972 and are estimated to be valued at \$855 million for 1974, may exceed \$1 billion in 1978. Consumption of metal forming machine tools, which dropped slightly between 1972 and 1974, is forecast at \$390 million for 1978. Spending for machine tool parts, accessories, and tools and dies rose from \$492 million in 1972 to

¹ In order to present a more accurate picture, growth rates have been calculated from the local currency values. This method eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars.

Year	DM/US \$1
1968	4.00
1970	3.66
1972	3.22
1973-78	2.41

\$695 million in 1974 and could reach \$816 million in 1978.

Due to the absence of official trade statistics for metal finishing equipment and an inability to accurately measure the market, discussion of the market outlook for such equipment has been excluded from this survey.

Success in selling metalworking equipment in world markets is enabling German manufacturers to increase production more rapidly than would be justified by the expansion of domestic demand alone. More than half of their 1974 output was sold abroad. Exports are expected to climb by about 7% per year during the next few years, approaching the \$2.3 billion level in 1978.

Motivated chiefly by price considerations, German end-users are buying an increasing proportion of their metalworking equipment needs from foreign suppliers, with liberal financing and superior after-sale service providing additional incentives to purchase abroad. The backlog of orders held by do-

mestic manufacturers does not seem to be a significant factor behind increased demand for imported metalworking equipment. Preliminary figures place Germany's 1974 imports at \$417 million, or at more than 22% of that year's domestic consumption (see Appendix). By comparison, imports supplied only 19% of the market in 1968. Foreign manufacturers should be able to increase their share of the German market to 26% by 1978, when imports are slated to reach \$575 million. Imports should rise at an average rate of almost 8.5% during the 1974-78 period, compared to 6.5% between 1972 and 1974.

American metalworking equipment, particularly numerically controlled (NC) machine tools, is highly regarded by German end users for its high quality and productive design features. The United States supplied nearly 11%, or over \$29 million, of Germany's metalworking equipment imports in 1972 (see table 2). Maintenance of this market share would put U.S. sales at nearly \$54 million in 1976.

Switzerland, with a 19% share of the 1972 import market, is the leading foreign supplier of metalworking equipment to Germany. Italy ranks second, owing its 14% share mainly to sales of competitively priced metal forming equipment. France and the United Kingdom earned 1972 market shares of about 12% and 9%, respectively. Austria, Japan, the U.S.S.R., Czechoslovakia, Yugoslavia, the Netherlands, and Spain also participate in the German MFE market.

Table 1.—Germany: Consumption¹ of metalworking equipment 1968, 1972, 1974, and 1978
(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories, tools, and dies	Other	Total
1968					
Production	524	255	324	—	1,103
Imports	48	20	34	—	102
Exports	364	196	114	—	674
Consumption	208	79	244	—	531
1972					
Production	1,019	527	611	—	2,157
Imports	123	63	88	2	276
Exports	564	335	207	—	1,106
Consumption	578	255	492	2	1,327
1974					
Production	1,496	737	954	—	3,187
Imports	201	83	133	—	417
Exports	842	488	392	—	1,722
Consumption	855	332	695	—	1,882
1978					
Production	1,830	900	1,170	—	3,900
Imports	278	112	185	—	575
Exports	1,104	622	539	—	2,265
Consumption	1,004	390	816	—	2,210

¹ Consumption equals production plus imports minus exports.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on German official trade statistics and trade source estimates.

The United States has been more successful than most other foreign suppliers in selling metal forming equipment to Germany. Sales by U.S. firms accounted for more than 20% of Germany's 1972 imports of such equipment. In many instances, American machinery is the only foreign-made metal forming equipment which meets Germany's rigorous industrial safety standards.

The German market for metal cutting machine tools merits fuller exploitation by American exporters and may hold the key to expansion of the U.S. share of the total metalworking equipment import market. In 1972, 8% of Germany's imports of metal cutting equipment were of U.S. origin.

German end-users buy accessories, tools and dies for machine tools from a number of different foreign sources. American manufacturers claimed an 8% share of this sector of the metalworking equipment import market in 1972.

Sales Opportunities

A market research study recently conducted in Germany for the U.S. Department of Commerce, Office of International Marketing, identified specific types of metalworking equipment for which American exporters are likely to find particularly favorable sales opportunities.

Mechanical presses.—U.S.-made mechanical presses enjoy a good reputation in Germany for quality and design. Imports accounted for almost \$26 million, or just under one-third of the market for such presses in 1972. U.S. sales exceeded \$9 million in that year. Substantially fewer of these presses were imported from Japan, Italy, Switzerland, and Belgium. Mechanical presses should continue to be strong sellers for American exporters despite the apparent decline in the rate of expansion of Germany's motor vehicle industry. U.S. sales could reach \$12.5 million in 1978. German customers are reported to be especially interested in the following:

- Punch presses and press brakes
- Crank presses
- Drawing presses

Germany.—Age of metalworking equipment currently in use

Age of equipment	Percent
Less than 5 years old	20
6 to 10 years old	39
11 to 15 years old	21
Over 15 years old	20
Total	100

Source: U.S. Department of Commerce, Bureau of International Commerce market research survey.

- Transfer presses
- Automatic blanking presses
- Friction presses

German manufacturers in 1972 produced \$126 million of mechanical presses, of which more than 50% were exported. Leading producers include G. Siempelkamp & Co. Maschinenfabrik, Maschinenfabrik Weingarten AG, and Schuler Pressen.

Milling machines.—American exporters have an excellent chance to boost their sales of milling machines to Germany. A survey of potential users revealed sufficient buyer interest to support a substantial increase in U.S. sales from the 1972 level of \$600,000. Switzerland and the Eastern European countries are the chief competitors in this area of the market.

The total German market for milling machines was valued at \$145 million in 1973. Domestic manufacturers, such as Wotan-Werke GmbH, Scharmann & Co., Schiess Aktiengesellschaft, Fritz Werner and Friedrich Deckel AG, exported 60% of their output. Imports supplied one-third of total consumption. German buyers have expressed strong interest in the following equipment:

- Small knee-type and bench-type milling machines
- Horizontal knee-type milling machines
- Bed-type milling machines

Perishable cutting tools and dies for machine tools.—The 1978 German market for cutting tools and dies is forecast at \$595 million, reflecting an average growth of 9% from its 1972 level of \$355

Table 2.—Germany: Imports of metalworking equipment from selected countries, 1972
(in thousands of U.S. dollars)

Equipment	U.S.	Switzerland	Italy	France	U.K.	Japan	Other	Total
Metal cutting machine tools	9,411	30,812	18,816	15,518	10,826	4,411	33,960	123,394
Metal forming machine tools	12,821	8,397	11,296	5,580	3,369	3,531	18,085	63,079
Subtotal metalworking equipment	22,232	39,209	30,112	20,738	14,195	7,942	52,045	186,473
Machine tool parts, accessories, tools and dies	6,877	12,114	7,659	11,229	9,228	1,539	39,074	87,720
Other	284	102	91	20	206	—	765	1,468
Total	29,393	51,425	37,862	31,987	23,629	9,481	91,884	275,661

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official German trade statistics.

million. The country's industry produced nearly \$400 million worth of cutting tools and dies in 1972 and sold 25% of this equipment on the world market. More than one-third of the \$760 million of tools and dies expected to be produced in 1978 probably will enter export channels.

German buyers find that foreign-made perishable cutting tools and dies are attractively priced. Imports, placed at \$60 million for 1972, could more than double (to \$125 million) by 1978. The United States, which sold \$3.7 million of cutting tools and dies to Germany in 1972, faces competition from several foreign suppliers, including France, Sweden, the United Kingdom, and Japan. Nevertheless, the U.S. approach of designing tools to meet the requirements of specific workpieces gives American manufacturers a competitive advantage over many other suppliers. U.S. sales are forecast to reach \$8 million in 1978. American exporters will find good opportunities to sell most kinds of dies, as well as the following items:

- Die sets for presses
- Carbide tools
- Milling cutters
- Drilling and tapping tools
- Lathe cutting tools

German imports of milling cutters and inserted-blade facing heads totaled nearly \$7 million in 1972. Purchases of drilling and cutting tools and lathe chucks approached \$4.5 million in that same year, while shipments of drawing dies from abroad amounted to \$450,000, and \$1.5 million of tapping tools were imported.

Parts and accessories for machine tools.—German end-users purchased \$136 million of parts and accessories for machine tools in 1972. Consumption is expected to rise by approximately 4% annually, reaching \$225 million in 1978. During the same period, domestic production is likely to climb from \$216 million to \$410 million. Manufacturers are expected to continue to export roughly 50% of their output.

Imported equipment supplied approximately 20% of the German market for machine tool parts and accessories in 1972, when shipments from abroad totaled \$28 million, including \$3.1 million from the United States. Foreign manufacturers should be able to increase their sales to \$60 million in 1978, with American exporters providing \$6 million of equipment. Items in high demand include:

- Chucks
- Boring bars
- Boring heads
- Magnetic chucks
- Dividing heads
- Grinding spindles
- Indexing heads

- Coordinate tables
- Rotary tables

Numerically controlled metal cutting machine tools.—German end-users are estimated to have purchased \$110 million of numerically controlled (NC) machine tools in 1972. Demand for advanced metalworking equipment is potentially high because German industry is struggling to maintain the price competitiveness of its products in the face of rapidly rising labor costs.

Germany initially began producing NC boring, drilling, and milling machines, following the development of point-to-point controls. With the development of continuous-path control technology, NC turning machines and machining centers were added to the product line. According to the Association of German Machine Tool Manufacturers (VDW), 1971 output of NC machine tools consisted of 816 units, valued at \$91 million and representing a 40% increase over the value of 1967 production. Machines with a continuous-path control accounted for slightly more than half of the units produced. Werkzeugmaschinenfabrik Gildemeister & Co. AG and Pittler Maschinenfabrik AG are the principal manufacturers, utilizing controls produced by Siemens and A.E.G.

The market for imported NC machine tools is just developing. Purchases from abroad totaled \$5.3 million in 1972. German buyers are looking for equipment which provides high productivity at low unit cost. Design features as well as price competitiveness are important considerations, and both versatile equipment and specialized tools will find a market. Such features as preadjusted tools, short tool changing times, and simple tape punching, which reduce preparation costs as well as provide high reliability in operation, are attractive.

U.S. sales of NC machine tools to Germany, which totaled \$387,000 in 1972, consisted mainly of center lathes and boring or milling machines. The United Kingdom, with sales of \$1.4 million, was highly successful in this market. Japan and Italy sold smaller quantities, but each is actively promoting a wide variety of numerically controlled machinery. American exporters should encounter strong demand for:

- Machining centers
- NC turning machines
- NC drilling machines
- NC horizontal boring and milling machines
- NC milling machines

Germany imported \$2.7 million worth of NC horizontal boring and milling machines in 1972; imports of NC drilling machines exceeded \$500,000 in that same year.

Other sales opportunities.—The following types of equipment have also been identified as potentially good sellers for American manufacturers of metalworking equipment:

Table 3.—Germany: End-users of metalworking equipment, by industry, 1970

Industry	No. of manu- facturers	Value of sales (in millions of U.S. dollars)	Value of capi- tal investment	No. of workers
Motor vehicles	473	12,209	1,044	631,000
Nonelectrical machinery	4,611	17,538	959	1,176,000
Electrical equipment and appliances	2,227	15,139	875	1,131,000
Pressed metals	3,312	5,920	312	412,000
Office machinery	70	1,614	301	99,000
Steel shaping	1,437	2,155	130	144,000
Optical goods, timepieces	877	1,794	97	169,000
Steel and light metal products	1,266	2,774	85	192,000
Drawing and rolling mills (cold)	328	1,755	80	64,000
Aviation equipment	40	471	36	40,000
Shipbuilding	114	956	33	71,000
Musical instruments, parts	863	656	24	61,000

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official German statistics.

- Polishing, lapping, and finishing machines
- Turning machines, lathes
- Boring machines
- Drilling machines
- Gear cutting and finishing machines
- Automatic turning machines
- Cylindrical grinding machines
- Thread-producing machines
- Tools and cutter grinding machines

Germany imported more than \$30 million of lathes in 1972; over 50% of these were conventional engine lathes. Single and multispindle automatics together accounted for \$8.4 million of the total.

Purchases of drilling machines from foreign suppliers totaled \$12.3 million in 1972, including \$4.5 million of conventional drilling machines, \$2.1 million each of vertical and radial drilling machines, and \$3 million of other drilling and boring machines.

Foreign sales of grinding machines to Germany in 1972 included \$13.6 million of plain cylindrical and internal grinding machines, \$3.3 million of surface grinding machines, and \$11.8 million of other grinding, polishing, and lapping machines.

Consumption of electrical discharge (EDM) electrochemical (ECM) and other nontraditional metal removal machines tripled in value in the 1968-72 period, rising from \$4 million to \$13 million. Imports of this equipment in 1972 totaled \$3.9 million.

End-User Industries

Industries whose manufacturing activities entail the use of metalworking equipment reported 1970 sales in excess of \$60 billion (see table 3). Their capital investment in that year was valued at nearly \$4 billion and they employed 4.2 million workers. Most user industries had experienced rapid growth during the previous 5 years. Sales rose by 51%, capital investment grew by 76%, and employment showed an 11% increase in 1970 when compared

with 1965 data. Particularly impressive gains were reported by manufacturers of aviation equipment, electrical equipment and appliances, motor vehicles, heavy machinery, optical goods, and timepieces.

The 10 principal sectors (ranked by capital expenditures) within the broadly defined user industries spent over \$2.7 billion for capital goods in 1969 (see table 4). These sectors are estimated to have allocated \$3.7 billion for such purposes in 1974 and may purchase \$4.4 billion in capital goods in 1978 (see table 5). Such an increase would represent an annual growth in capital expenditures of nearly 5%.

With the exception of the electrical equipment and appliance sector, the level of automation at present is low among end-users of metalworking equipment. There is, however, growing recognition of the urgent need for more advanced production equipment. The degree to which future labor costs rise and the outlook for the economy as a whole will determine industry's response to this need.

Motor vehicles.—Germany's motor vehicles industry is undergoing a period of readjustment after

Major end-user firms and prospective customers in Germany for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—Germany*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20203, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Table 4.—Germany: Principal end-users of metalworking equipment, by industry sector, 1969

Sector	No. of plants (in millions of U.S. dollars)	Shipments	Capital expenditures
Motor vehicles and parts..	332	9,405	657
Electrical equipment and appliances	2,122	11,578	651
General industrial machinery	1,119	3,736	152
Metalworking equipment..	871	1,783	125
Office machinery	60	795	109
Steel shaping	1,358	1,633	89
Equipment for rolling mills, steelworks	639	2,211	81
Production of driving elements	197	886	75
Apparatus manufacture ..	595	1,515	74
Drawing and rolling mills (cold)	341	1,475	69
Subtotal principal sectors	7,634	35,017	2,082
Total of all other sectors	7,681	13,993	680
Total all sectors	15,315	49,010	2,762

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official German statistics.

years of dynamic growth. The sector has accounted for approximately 20% of the total net value of production of Germany's capital goods industries. Passenger cars have represented 75% of its output. Purchases of metalworking equipment, which totaled \$416 in 1972 are estimated at \$593 million for 1974.

Most of the machinery in use in the German vehicle industry is manually controlled; much of the remainder is only partially automated. There is good potential for machine tool investment in more sophisticated equipment. Car, truck, and bus manufacturers are especially interested in purchasing U.S.-made mechanical presses; polishing, lapping, and finishing machines; and gear cutting and finishing equipment.

Electrical equipment and appliances.—The technological level is extremely high in this industrial branch, which includes manufacturers of electrical machinery, communications equipment, transformers, batteries, and electrical appliances. Most companies have regularly spent substantial sums to update their production equipment. The value of the sector's capital investment nearly doubled between 1965 and 1970. Capital expenditures, preliminarily placed at \$1.2 billion for 1974, are expected to rise by 5.5% annually through 1978.

Makers of electrical equipment and appliances spent \$74 million for metalworking equipment in

1972 and an estimated \$105 million for such machinery in 1974. Their 1978 purchases are forecast at \$124 million. American exporters of metalworking equipment will find customers in this sector interested in boring machines, cylindrical grinding machines, and turning machines.

Metalworking and metal finishing equipment.—Manufacturers of machine tools will need to raise their capital spending by nearly 4% per year in order to achieve the 5.2% yearly expansion of production projected for the 1974-78 period. Purchases of machine tools, which totaled \$73 million in 1972, are estimated at \$103 million for 1974 and could exceed \$120 million in 1978. Although the industry is technologically advanced, the proportion of manually controlled machinery in use is still very high. U.S. suppliers should find German makers of metalworking equipment interested in buying most types of numerically controlled machinery as well as conventional milling machines and drilling machines.

General industrial machinery.—With future growth in output and capital expenditures slated to parallel that of the metalworking equipment sector, manufacturers of general industrial machinery estimate their 1978 requirements for machine tools at more than \$110 million. Their 1974 purchases of metalworking equipment are put at \$94 million, up more than 40% from their 1972 level. American-made numerically controlled machine tools, along with conventional milling machines and drilling machines, are rated as having good sales potential.

Steel drawing, forming, and cold rolling.—German output of pressed, drawn, and cut metal parts, screws, wire, coils, and sheet metal is expected to

Table 5.—Germany: Capital expenditures of principal end users of metalworking equipment, by industry sector, 1970, 1974, and 1978

(in millions of U.S. dollars)			
Sector	1970	1974	1978
Motor vehicles and parts	650	1,203	1,469
Electrical equipment and appliances	667	1,253	1,552
General industrial machinery ..	138	244	282
Metalworking equipment	114	201	234
Office machinery	100	176	205
Steel shaping	77	133	151
Equipment for rolling mills, steelworks	74	130	151
Production of driving elements	69	122	141
Apparatus manufacture	68	120	139
Drawing and rolling mills (cold)	60	104	118
Total	2,017	3,686	4,442

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official German statistics and trade source estimates.

remain stable throughout the 1974-78 period. Marked gains in the value of the sector's capital investment, combined with a slight decline in employment, were noted during the 1965-70 period. The years just ahead should see continued emphasis on automation, particularly of finishing processes. Capital expenditures may climb from \$234 million to almost \$270 million annually during the 4-year period.

Sector purchases of machine tools, which totaled \$77 million in 1972, are placed at \$109 million for 1974 and could approximate \$130 million in 1978. Firms in Germany's steel drawing, forming, and cold rolling industry are especially interested in purchasing presses, cutting machines, sawing machines, and shears from the United States.

Domestic Manufacture of Metalworking Equipment

Germany is one of the world's largest producers of metalworking equipment, with an output in 1974 of more than \$3 billion. Production of such machinery has been rising by more than 5% per year, after having doubled between 1968 and 1972. If maintained, this growth rate would push output to almost \$4 billion by 1978.

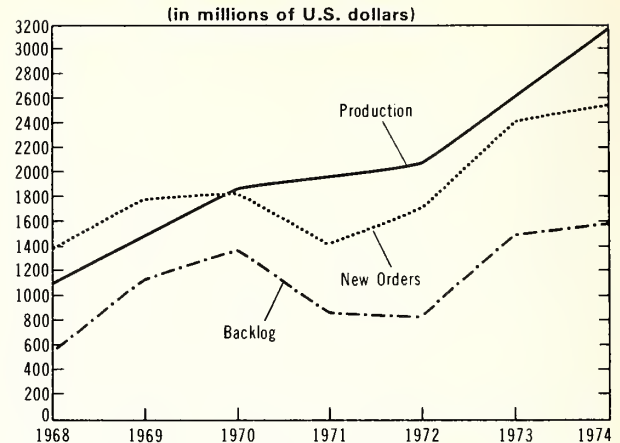
While German manufacturers supplied almost 80% of the domestic market for metalworking equipment in 1974, their share is declining as rapidly rising prices and world currency realignments make imports more attractive. Market analysts suggest that the domestic industry's share of the market may fall below 75% in 1978.

Although approximately 1,000 companies are reported to be engaged in the manufacture of metalworking equipment, including parts, accessories, and tools and dies for machine tools, only about 100 firms can be counted as major producers of such equipment.

Gildemeister AG, with annual sales in the \$80-million range, is the largest firm in the industry. Its six plants include those of its subsidiaries, Heidenreich & Harbeck, and Max Muller Brinker Maschinenfabrik. The fact that Gildemeister's work force includes an unusually high percentage of skilled production workers and technical personnel is a key factor in the firm's ability to maintain its reputation for high-performance equipment.

German manufacturers produce a complete range of general purpose and special purchase machine tools, including NC equipment. German-made metalworking equipment has a worldwide reputation for high quality and superior performance. Exports, which for 1974 are estimated to be \$1.7 billion, rose by 8% per year between 1972 and 1974. Annual increases averaging more than 7% are predicted for the 1974-78 period, and at that rate ex-

Figure 2: -Germany: Machine tool production, new orders and value of backlog held by local manufacturers 1968-74.



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on German trade source estimates.

port sales would reach \$2.3 billion at the end of the 4-year period.

Trade Regulations and Practices

Customs duties applicable to metalworking equipment imported from the United States range from 3.5 to 11%. Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4127, Main Commerce Building, Washington, D.C. 20230.

The conditions under which imported or domestic metalworking equipment can be sold, financed, delivered, installed, and guaranteed have been published by the Association of German Machine Tool Manufacturers (VDW). Most sales are made by distributors; manufacturers' direct sales offices also account for a significant portion of business, particularly in the case of sophisticated and specialized machinery and equipment. The acquisition of NC and other sophisticated equipment, requiring frequent technical assistance tailored to the needs of individual customers, has necessitated the advent of full service distributors.

Technical Requirements

The characteristics of Germany's electrical supply are 220 volts/50 hertz, single-phase and 380 volts/50 hertz, 3-phase.

The metric system of weights and measures is the statutory standard in Germany.

Technical standards applicable to metalworking equipment are coordinated by the German Standard-

ization Committee (Deutscher Normenausschuss—DNA). Machinery must meet DIN mechanical standards and VDE electrical standards. In addition, each installation of metalworking equipment is inspected for compliance with public safety regulations before a permit is issued for its operation. Published national standards for metalworking and finishing equipment in Germany may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230: "The Market for Metalworking and Finishing Equipment in Germany," DIB 74-07-503, January 1974.

Appendix

The following tables contain additional information for the U.S. businessman who is considering selling his products in Germany. The first table gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by Germany in 1968, 1970, and 1972. In addition, projections are made in the second table (by product category only) for the years 1974, 1976, and 1978.

Germany: Imports of metalworking equipment, 1968-72, alternate years
(in thousands of U.S. dollars)

Type of Equipment	1968	1970	1972	Type of Equipment	1968	1970	1972
<i>Metal cutting machine tools:</i>				Gear cutting machines, not cylindrical toothing	758	3,763	1,801
Planing machines	348	824	1,029	Non traditional metal removing machines	1,479	3,017	3,952
Shaping machines	175	479	252	Transfer, unit head, and way type machines	1,683	6,318	6,004
Broaching machines	411	368	1,016				
NC center lathes	—	1,352	1,806	Total	47,540	143,135	123,394
Center lathes not NC	7,131	24,941	15,112	<i>Metal forming machine tools:</i>			
NC facing lathes and vertical boring and turning mills	—	205	16	Bending and straightening machines for tubes, shafts, bars and sections	3,851	4,546	4,946
Facing lathes and vertical boring and turning mills, not NC	388	1,469	1,846	Forging hammers and dies ..	580	422	412
Other NC lathes (roll and bar turning lathes)	—	168	104	Draw benches for bars and pipes	387	532	1,038
Other lathes (roll and bar turning lathes)	1,084	2,324	2,295	Eccentric presses	590	3,025	1,404
NC capstan and turret lathes	—	521	159	Other mechanical presses	3,394	7,869	22,660
Capstan and turret lathes, not NC	691	1,656	742	Hydraulic presses for bolts, screws, nuts, and rivets	2,017	5,694	8,046
Single-spindle automatics	3,438	8,114	3,736	Shears and punching machines	2,169	5,953	6,203
Multispindle automatics	1,357	6,598	4,724	Other sheet metal working machines	1,779	3,801	3,552
NC drilling machines	—	177	512	Wire drawing machines	105	359	719
Drilling machines, not NC ..	324	1,207	4,556	Wire netting and weaving machines, cable making machinery	544	1,225	1,983
Vertical drilling machines	1,342	3,120	2,105	Heald braiding machines	427	1,042	4,327
Radial drilling machines	560	2,635	2,100	Other wire working machines	246	114	921
Other drilling and boring machines	843	2,541	2,987	Coiling and winding machines	3,155	5,159	5,270
Jig boring and milling machines	2,806	9,581	5,049	Mechanical presses for bolts, screws, nuts, and rivets	789	2,363	1,578
NC horizontal boring and milling machines	—	1,236	2,723				
Horizontal boring and milling machines, not NC	1,570	4,960	5,990	Total	20,031	42,104	63,079
Hand-fed milling machines	4,314	12,482	11,017	<i>Other metal working equipment:</i>			
Other milling machines	3,105	9,417	8,439	Machine tools for the handling of nuclear fuel	—	13	2
Cold circular sawing machines	270	817	767	Scrap balers and presses for powder metal	—	609	1,366
Other sawing machines	622	1,566	2,054				
Plain cylindrical and internal grinding machines	4,563	13,551	13,619	Total	—	622	1,468
Surface grinding machines ..	69	2,957	3,309	<i>Parts and accessories for MT:</i>			
Other grinding, polishing, and lapping machines	3,239	6,252	7,438	Accessories, attachments, and auxiliary equipment for heald braiding machine	89	178	244
Grinding, polishing, and lapping machines without precision or measuring instruments	1,928	4,406	4,488	Accessories, attachments, and auxiliary equipment for wire working machines	33	126	79
Gear cutting machines, cylindrical toothing	2,242	4,113	1,631				

Germany: Imports of metalworking equipment 1968-72, alternate years—Con.

(in thousands of U.S. dollars)

Type of Equipment	1968	1970	1972
Accessories, attachments, and auxiliary equipment for coil and winding machines	741	2,668	2,999
Other accessories, attachments, and auxiliary equipment	8,355	23,736	24,857
Total	9,218	26,708	28,179
<i>Tools and dies for MT:</i>			
Bands for bandsawing machines	479	646	821
Circular saw blades	145	161	340
Drilling tools	2,912	8,140	8,709
Milling cutters and inserted blades facing heads (steel)	—	—	3,816
Milling cutters and inserted blades facing heads (hard metal)	1,661	3,051	2,990
Reamers, countersinks, and broaching tools (steel)	625	1,774	—
Reamers, countersinks, and broaching tools (hard metal)	—	—	471
Drilling and cutting tools, lathe chucks (steel)	—	—	1,731
Drilling and cutting tools, lathe chucks (hard metal)	833	2,594	2,686

Type of Equipment	1968	1970	1972
Gear cutting tools	448	574	627
Taps	484	1,409	1,494
Cutting, punching, and stamping tools	8,029	11,230	12,526
Other exchangeable tool (steel)	1,661	2,528	1,777
Other exchangeable tools (hard metal)	—	337	451
Drawing dies	1,060	1,447	1,821
Shear knives	6,094	14,968	12,913
Plates, sticks and centers from hard metal	24,431	48,829	59,541
Total	24,431	48,829	59,541
Total metalworking equipment	101,110	261,398	275,661

Germany: Imports of metalworking equipment, 1974-78, alternate years

(by product category only; in millions of U.S. dollars)

Type of Equipment	1974	1976	1978
Metal cutting machine tools	201	237	278
Metal forming machine tools	83	95	112
Parts and accessories for MT	41	50	60
Tools and dies for MT	91	108	124
Total metalworking equipment	416	490	574

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and German trade source estimates.

Israel

The Israeli economy is expected to resume its rapid growth as the country returns to normalcy following the Middle East crisis precipitated by the October 1973 War. A better than 11%¹ growth rate is projected for the economy during the 1974-78 period. Gross national product in 1973 was about \$7 billion.

Growth of Israel's industrial sector has paralleled the expanding economy. High levels of investment, both private and public, have resulted in a steady increase in the value of industrial output to an estimated \$4.5 billion in 1974.

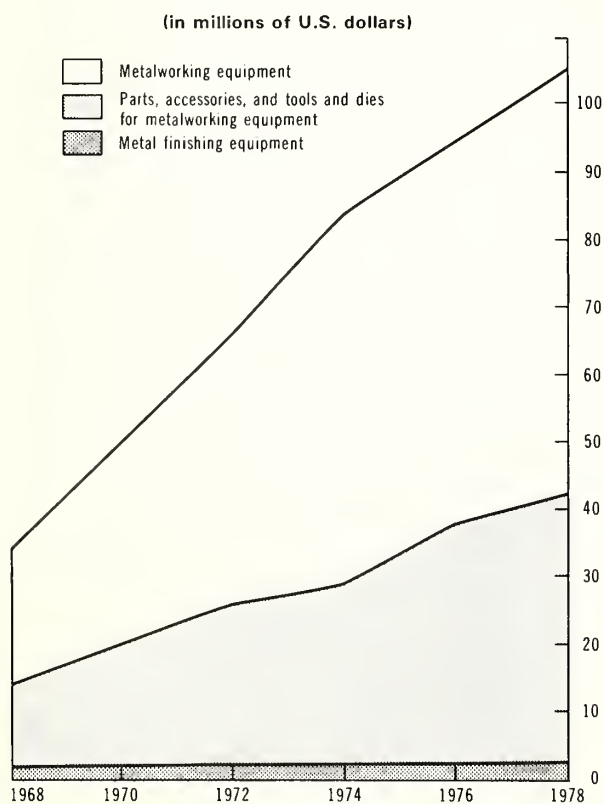
The continuing emphasis on broadening the country's industrial base should boost capital investment by over 20% annually during the 1974-78 period—from \$1.9 billion to more than \$4 billion. Israel will have to continue to rely heavily on imported capital equipment to achieve its development goals, and American manufacturers are in a particularly strong position to maintain a leading share of the import market.

Economic development in Israel has been achieved against a background of large defense requirements. This has given great impetus to the expansion of the economy as a whole and in particular to the market for metalworking and finishing equipment (MFE), as the emergence of a viable metals industry is considered necessary for achieving the country's goal of self-sufficiency in meeting its military requirements and in carrying out basic industrial development programs.

The Israeli market for metalworking and finishing equipment expanded by 92% during the 1968-72 period to reach \$66.4 million (see table 1). From 1974 to 1978, the country's MFE consumption should increase from about \$83.5 million to \$106 million, corresponding to an average annual rise of nearly 6.1%.

Although nearly 50% of the machines in use in Israel have been purchased since 1969, and about 70% of them are less than 10 years old, Israel's dynamic industrial development is expected to generate continuing demand for new equipment. Re-

Figure 1. - Israel: Consumption of metalworking and finishing equipment, 1968-1978, alternate years.



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Israeli Government statistics and trade source estimates.

¹ In order to present a more accurate picture, growth rates have been calculated from the local currency values. This method eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	IL/US\$1.00
1965-69	3.02
1970	3.50
1971-78	4.20

quirements for new machinery for growing defense as well as other needs are reflected in projections for growth of the market for metalworking equipment, including metal cutting and metal forming machine tools and other metalworking equipment.¹ Due to the increase in domestic production of metalworking machinery from 1972 to 1974, imports during that period declined by about 23%, dropping from \$22 million to \$16.8 million (see Appendix). Although local output is projected to climb to \$45 million in 1978, rising demand for advanced items not yet produced in Israel should push that year's imports to a \$24-million level. Exports—totalling

¹ Included in the category "metalworkng equipment" in this report are metalworking machine tools, both metal cutting and metal forming types, as well as foundry, rolling mill and welding equipment usually categorized as "other metalworking equipment." Available Israeli statistics do not permit a more detailed breakdown.

only \$1.6 million in 1974—are expected to represent \$6 million in 1978.

The sizable market for parts, accessories, tools and dies for metalworking equipment, including precision measuring and testing equipment, grew by almost 15% a year during the 1972-74 period, expanding from \$24.9 million to \$32.9 million. Consumption should reach \$40 million in 1978. Although domestic machine tool manufacturers are becoming increasingly competent in meeting the country's requirements for conventional parts, accessories, tools, and dies, imports should supply a substantial but declining portion of this market. Imports amounted to \$8.6 million in 1972, or 35% of consumption, and are expected to provide \$12 million, or 30%, of the projected 1978 market. Local production in the latter year should approach \$37 million as compared to \$19 million in 1972.

Israel's small market for metal finishing equipment is expected to reach a level of \$3 million in 1978. Since there is no significant local production, most demand will be met by foreign suppliers. Purchases registered a slight decline during the 1972-74 period, dropping from about \$2 million to \$1.5 million.

Domestic manufacturers of machine tools are

Table 1.—Israel: Consumption¹ of metalworking and finishing equipment, 1968, 1972, 1974, and 1978
(in millions of U.S. dollars)

	Metalworking equipment ²	Parts, accessories, tools and dies for metalworking equipment ³	Metal finishing equipment	Total
1968				
Production	7.14	9.70	⁴	16.84
Imports	14.63	5.03	1.40	21.06
Exports	2.39	.98	—	3.37
Consumption	19.38	13.75	1.40	34.53
1972				
Production	19.83	19.00	⁴	38.83
Imports	21.97	8.62	2.02	32.61
Exports	2.21	2.72	.06	4.99
Consumption	39.59	24.90	1.91	66.40
1974				
Production	34.02	29.00	⁴	63.02
Imports	16.81	5.98	1.50	24.29
Exports	1.63	2.10	.05	3.78
Consumption	49.20	32.88	1.45	83.53
1978				
Production	45.00	37.00	⁴	82.00
Imports	24.00	12.00	3.00	39.00
Exports	6.00	9.00	⁵	15.00
Consumption	63.00	40.00	3.00	106.00

¹ Consumption equals production plus imports, less exports.

² Includes metal cutting and metal forming machine tools, and "other metalworking equipment."

³ Includes precision inspection, measuring, and testing equipment.

⁴ Included in metalworking equipment.

⁵ Less than \$50,000.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Israeli statistics and trade source estimates.

striving to increase production, and the backlog of orders for their products is small; however, these are not important factors in influencing the size of the import market. Israel's market for metalworking and finishing equipment has been and will continue to be heavily dependent on foreign suppliers. Imports in 1972 amounted to \$32.6 million, or nearly half of that year's total consumption. The country's efforts to become more self-reliant in machine tools, especially conventional items, are likely to result in a decline in the proportion of imported MFE to the total market. Nevertheless, immediate needs for high-performance equipment (not readily available from domestic sources) should partially offset this trend. Imports are expected to climb during the 1974-78 period from \$24.3 million to \$39 million, which should represent approximately 36% of consumption. Concurrently, planned expansion of production facilities is projected to yield a sharp rise in domestic output, bringing the level from \$63 million in 1974 to \$84 million in 1978. Exports are anticipated to rise from about \$3.8 million to \$15 million in the same period.

The close ties between the United States and Israel should serve to strengthen the U.S. position in the market. American manufacturers were the second-largest foreign supplier group, providing \$6.6 million, or 21%, of 1972 MFE imports (see table 2). The increasing popularity of advanced MFE made in the United States is expected to moderately erode the competitive stance of European producers, particularly that of German suppliers, who had a 30% market share in 1972. The United Kingdom, with 14% of 1972 imports, and Italy, with a 13% share, were the only other major foreign suppliers.

The United States has faced its keenest competition from Germany in sales of machine tools and other metalworking equipment. In 1972, German suppliers accounted for 32% of this equipment category, American suppliers 15%, and United Kingdom suppliers 14%. The United States was Israel's leading foreign supplier of parts, accessories, tools and dies, with a 28% market share in 1972, but Germany followed closely with 24%. American suppliers dominated the small import market for

Israel: Age of metalworking and finishing equipment currently in use

Age of equipment	Percent
less than 5 years old	43
6 to 9 years old	25
10 to 15 years old	13
over 15 years old	19
Total	100

Sources: U.S. Department of Commerce, Bureau of International Commerce, Market Research Study.

metal finishing equipment: Israel purchased U.S.-made products worth \$902,000 in 1972, and \$579,000 worth of this equipment came from Germany.

Specific Sales Opportunities

A market research study recently conducted in Israel for the U.S. Department of Commerce, Office of International Marketing, revealed widespread interest in a broad range of U.S.-made metalworking and finishing equipment. Interviews with trade experts, response to a questionnaire mailed to principal MFE end-users, and analysis of import statistics indicated certain product subcategories which should offer particularly promising sales opportunities for American exporters.

Parts, tools, accessories, attachments, and auxiliary equipment.—The tendency of Israeli manufacturers to maximize the use of existing machinery by adding new tools and accessories has given rise to a sizable market for these products. Purchases of tools, accessories, and related equipment are projected to rise by almost 7% annually, from their 1972 level of \$13.5 million, to reach \$20 million in 1978.

Foreign suppliers should satisfy an increasing portion of the country's requirements because domestic manufacturers are not expected to keep pace with the anticipated growth of the market. Imports, which amounted to \$3.8 million in 1972, or 28% of that year's total consumption, should account for nearly 50% of the 1978 market. The three major Israeli manufacturers, Vargus Ltd., Ashot Ashkelon

Table 2.—Israel: Imports of metalworking and finishing equipment from selected countries, 1972
(in thousands of U.S. dollars)

Equipment	United States	Germany	United Kingdom	Italy	Japan	Other	Total imports
Metalworking equipment	3,266	6,928	3,118	2,448	190	6,024	21,974
Parts, accessories, tools, and dies for metalworking equipment	2,386	2,107	1,249	1,575	445	853	8,615
Metal finishing equipment	902	579	131	151	48	206	2,017
Total	6,554	9,614	4,498	4,174	683	7,083	32,606

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Israeli statistics and trade source estimates.

Ltd., and Iscar Ltd., produce only limited quantities of a narrow range of parts, tools, accessories, and other auxiliary equipment.

Israeli industrialists have a high regard for tools, dies, and accessories from the United States. Efforts to shorten delivery times via air freight, along with price competitiveness, have improved the American position. U.S. suppliers should be able to increase their share of the import market—about 20% in 1972—during the next 5 years. Germany, the largest foreign supplier (almost a 30% share of 1972's imports), offers the strongest competition to the United States.

Israel's imports of parts and accessories for metal-working equipment amounted to \$2.8 million in 1972 and should top \$4 million in 1978. The United States was the second largest foreign supplier, providing 18% of the 1972 import market as compared to 36% from Germany. The following should represent good sales opportunities for American manufacturers:

- Arbors
- Chucks
- Collets
- Copy attachments
- Grinding attachments and spindles
- Saw blades

Purchases of foreign-made saw blades, among the largest items in the tool and die market, amounted to \$576,000 in 1972, of which American manufacturers supplied roughly one-third and German producers accounted for 18%.

Bending and forming machines.—Strong demand for pipe and other formed metal products for use in Israel's large-scale housing and industrial development projects should boost the market for bending and forming machines by 20% annually during the 1972-78 period. The country imported nearly all its \$2.4 million consumption of this equipment in 1972, and imports should be equally important to the projected 1978 market of \$7 million. The one domestic manufacturer, Hamat-Simat Ltd., a subsidiary of Koor, has no plans to increase its limited output of bending and forming equipment.

Israeli manufacturers are now discernibly changing their purchasing decisions to favor the United States over European suppliers. American exporters of the following items should find promising markets:

- Bar and tube benders
- Roll forming machines
- Pipe benders
- Plate bending rolls
- Mechanical press brakes
- Other bending and forming machines

Inspection, measuring, and testing equipment.—The Israeli defense establishment's need for high-quality precision metal products has created a sizable and growing market for inspection, measuring,

and testing equipment. Consumption is projected to rise by over 12% a year between 1972 and 1978, climbing from \$9.5 million to reach \$19 million.

Supported by the steady development of an indigenous electronics industry, domestic manufacturers are now able to supply many types of sophisticated instruments and should be increasingly competent in meeting the country's requirements. As a result, imports will account for a declining but nonetheless substantial portion of this market. Imports in 1972 amounted to \$4.9 million, or over 50% of that year's total consumption; purchases of foreign equipment should represent about \$7.5 million, or nearly 40% of the projected 1978 market. The leading local producers are Electro-Optic Industries, Rehovot, Elta Ltd., and Tadiran Ltd.

Despite the planned expansion of domestic production, Israel will remain dependent on foreign suppliers for certain types of equipment not yet available locally. End-users in the country will continue to import high-performance equipment.

The technological superiority of American-made testing and measuring equipment gives the United States a substantial lead in this market. The United States accounted for approximately 36% of 1972 imports, in comparison with only 18% from Germany and 16% from the United Kingdom. By using air freight to ship this type of equipment, U.S. manufacturers have been able to overcome delivery time advantages enjoyed by European competitors.

The following types of inspection, measuring, and testing equipment should be in demand from American manufacturers during the next 5 years:

- Optical and mechanical comparators
- Hardness testing equipment
- Layout machines
- Roundness measuring instruments
- Surface measuring equipment
- Recording and testing equipment

Punching and shearing machines.—Israeli industry absorbed about \$3.6 million of punching and shearing machines in 1972. Programs to expand production of metal products, particularly of those for defense needs, should generate a 9% annual growth in the market for punching and shearing machines during the 1972-78 period. Purchases are projected to reach \$6 million in 1978, of which 67%, or \$4 million, will most likely be imported.

The one domestic manufacturer of these types of equipment, Simat Ltd., has no plans for expanding production, and a large proportion of its present output is for in-house use by other Koor Metal works Ltd. subsidiaries or for export. Although there is some competition from European suppliers, Israeli manufacturers show a marked preference for U.S.-made machinery, especially punching equipment.

The biggest sales in 1972 were recorded for hydraulic guillotine shears, mechanical guillotine

shears, and punching machines. A strong demand is expected for a broader range of equipment, including the following items:

- Rotary shears
- Hydraulic shears
- Mechanical shears
- Nibbling machines
- Notching machines
- Combination punching and shearing machines
- Punching machines

Sawing, filing, and cutoff machines.—Israel's consumption of sawing, filing, and cutoff machines amounted to \$3.5 million in 1972 and is expected to total \$4.5 million in 1978. As there is no domestic manufacture of these products, all the country's requirements are satisfied by foreign suppliers.

The solid reputation for quality achieved by U.S. manufacturers of sawing, filing, and cutoff machinery has helped minimize competition from European producers. This steadily expanding import market should continue to offer good sales possibilities to American suppliers, with the following items expected to be in demand for the next several years:

- Abrasive cutoff machines
- Circular sawing machines
- Filing machines
- Horizontal bandsawing machines
- Vertical bandsawing machines
- Other sawing and filing machines

Other sales opportunities.—Trade sources in Israel believe that American manufacturers of other types of machine tools, such as mechanical presses, drilling machines, grinding machines, milling machines, lathes, and polishing, lapping, and honing machines, should also find substantial sales potential during the next 4 years. Demand will also be strong for metal parts cleaning and finishing equipment and for wire forming machinery. Imports of machinery to clean metal products, for example, should exceed \$3 million in 1978, up from \$2 million in 1972. Purchases of foreign-made lathes are expected to climb from \$2.8 million to \$4 million during the 1972-78 period.

Numerically controlled (NC) metalworking machinery was introduced in Israel in 1968 in response to the strong demand for metal products for defense purposes which developed following the Six Day War (1967). Responding to the incentives provided under the Government's Law for Encouragement of Capital Investments, the largest subcontractors for the Ministry of Defense were the first to purchase such equipment. Other smaller companies followed suit in order to compete for defense contracts. By 1972, the number of machines with numerical controls reached 100, and almost all of them were the property of publicly owned companies. The future market for NC systems appears limited, however, because present equipment is underutilized, and service capabilities for NC systems in the country

are considered inadequate. Because manufacturers now plan to maximize their use of existing equipment, only a few new systems are likely to be acquired through 1978. These systems will probably be purchased by major defense subcontractors that face a shortage of skilled workers and still must produce precision metallic parts in large quantities.

Israeli manufacturers apparently need more technical information about numerical controls for retrofitting and for use with digital readout systems. There are no numerical controls which have been installed on machine tools already in use, and only a few digital readouts have been purchased. Of the two systems, there is a general preference for digital readout devices, which are considered more suitable to the country's industrial requirements and less expensive than NC.

Electrical discharge machines (EDM) and electrochemical machining (ECM) equipment, both relatively new to Israel, have been acquired by a number of large manufacturers. Although prospects for EDM over the next several years are good, the market is limited by the number of industries in the country that can efficiently use this equipment; the total EDM population probably will not exceed 40 by 1978. Similarly, demand for electrochemical machines is confined to the largest end-users, and the total consumption forecast for the next 5 years is about 100 ECM's.

End-User Industries

The industries which constitute Israel's end-users of metalworking and finishing equipment have recently experienced a period of rapid development and consolidation. Although the number of manufacturers utilizing MFE declined from 1,785 in 1965 to 648 in 1970, their work force grew from 25,787 to nearly 34,000, over the same period (see table 3). Their combined capital investments climbed by over 20% annually during the 1965-70 period, rising from \$14.5 million to reach \$32.8 million. Total sales evidenced a 21% average annual increase, rising to above \$370 million in 1970 from \$178 million 5 years earlier.

The Six-Day War proved to be an important turning point for Israeli end-users of metalworking machinery. The policy adopted by the government to develop an indigenous capability for the production of intricate parts and systems for aircraft, military vehicles, and weapons brought about a profound change in the technological level of many of the country's users of machine tools. These industries, considered essential to the country's basic defense needs and its continued economic progress, enjoyed a large flow of investments.

Through the Law of Encouragement of Capital Industries, Israel's government maintains an active role in the nation's economic progress. This Law

Table 3.—Israel: End-users of metalworking and finishing equipment, by industry, 1970

Industry	No. of manu- facturers	Value of sales (in millions of U.S. dollars)	Value of capi- tal investment	No. of workers
Aircraft and parts; boats and ships	12	73.4	14.6	11,718
Nonferrous metal products, other than tin	335	114.7	8.9	9,871
Iron and steel products	12	33.4	1.2	1,235
Tin and tin products	130	40.1	3.4	3,113
Motor vehicles and parts	77	68.9	3.6	5,281
Watches, clocks, and parts; musical instruments, tape and record players	77	13.2	0.7	1,627
Arms and ammunition ¹	—	—	—	—
Railway equipment	—	—	—	—
Other metal products	5	26.4	0.4	1,039
Total	648	370.1	32.8	33,884

¹ Classified data.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Israeli statistics.

aims to improve the situation of all industrial firms by tax concessions that favor renewal of machinery, expansion of plant facilities, and mergers which lead to increased efficiency in production. The government additionally provides financial incentives to encourage industrial research and development. According to the Law, industrial enterprises may be eligible for Approved Enterprise Status, which is granted to economically feasible endeavors that usually are located in a development zone and/or are engaged in exporting a portion of their output.

Cash grants or development loans are made on the basis of the enterprise's location. In addition to cash grants, Approved Enterprises are entitled to medium- and long-term loans at subsidized rates from appropriate banking institutions. A special publicly owned bank, the Industrial Development Bank Ltd., grants long-term credits to industrial enterprises.

An Approved Enterprise is exempt from income tax and pays a reduced company profits tax during a 5-year period that falls within its first 10 years of operation; other tax concessions are extended with respect to dividends and depreciation of capital equipment. Exemptions are also granted on customs duties, purchase taxes, and other indirect charges on imported equipment, if it is not produced domestically or if similar Israeli-made machinery is not competitive in price, quality, or delivery time. To encourage the use of locally fabricated machinery and equipment, Approved Enterprises are offered a grant equal to 15% of the equipment's value if it is of domestic manufacture. Benefits under the Law for the Encouragement of Industry (Taxes) 1969 are also extended to other industrial enterprises which have not been accorded Approved Enterprise status.

The principal industry sectors using MFE included 1,145 companies in 1970 (see table 4). Together they accounted for \$49.7 million, or 85%, of expenditures recorded for all end-users of metal-

working and finishing equipment in 1970. These sectors are expected to increase their capital expenditures by more than 23% a year during the 1974-78 period, bringing their combined total from an estimated \$81 million to over \$157 million (see table 5).

Manufacture and repair of maritime and aircraft equipment.—The manufacture and repair of maritime and aircraft equipment are necessary to the defense of Israel. This industry consequently is one of the country's most vital and ranks among the largest users of metalworking equipment. Of the 12 manufacturers in this sector, 10 are engaged in the manufacture of aircraft and missiles, the repair and overhauling of aircraft and aircraft engines, and the manufacture of complete aeronautic systems. The industry additionally manufactures a broad range of spare parts components and systems, annual exports of which are now valued at about \$10 million and should reach at least \$60 million by 1975.

The largest manufacturer is Israel Aircraft Industries, which employed 15,000 people in 1973. This firm produces and exports the domestically developed STOL "Arava" aircraft and also manufactures under license the U.S.-designed "Commodore"

Major end-user firms and prospective customers in Israel for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—Israel*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Table 4.—Israel: Principal end-users of metalworking and finishing equipment, by industry sector, 1970-71

Sector	No. of plants	Shipments (in millions of U.S. dollars)	Capital expenditures (in millions of U.S. dollars)
1. Manufacture and repair of maritime and aircraft equipment	12	64.7	12.2
2. Structural metal products and metal workshops	432	126.9	10.9
3. Industrial and building equipment	125	52.9	7.2
4. Communication electronic equipment and consumer electronics	65	85.0	5.6
5. Home appliances	102	69.0	3.9
6. Manufacture of cars, motorcycles, and parts	77	60.9	3.0
7. Tinware products	130	33.9	2.8
8. Metal products	104	13.6	1.5
9. Pumps, compressors, pumping equipment and desalination equipment	43	16.8	1.3
10. Precision, optical, and photographic equipment	55	11.2	1.3
Subtotal: 10 largest sectors	1,145	534.9	49.7
Subtotal: all other sectors	463	221.5	8.7
Total: all end-user sectors	1,608	756.4	58.4

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Israeli statistics.

executive jet. Another company, Bet Shemesh Engines, specializes in jet engines and components, both for the Israel Defense Forces and for foreign customers.

Two concerns are involved in the manufacture and repair of maritime equipment. The most important of the two is the Israel Shipyards, located in Haifa Bay, which fabricates special boats for the Navy, repairs vessels, and manufactures special metal products, including metal products for building and construction.

The sector's capital expenditures have increased markedly since 1967 as defense needs have become more pressing. From 1970 to 1974 alone, they climbed by over 30% a year, rising from \$12.2 million to \$35.7 million. Capital expenditures are projected to expand during the 1974-78 period at a slower but substantial rate, reaching almost \$60 million in the latter year.

Shipments by manufacturers in the sector are expected to reach \$214 million in 1978, almost double the 1974 level of \$119 million. Shipments increased

at a rate of about 22% during the 1970-74 period, rising from a base of \$64.7 million.

Since all aircraft enterprises are government-owned, most of their data is classified. Although there are no announced plans concerning the sector's future purchases of metalworking and finishing equipment, it seems certain that technologically advanced machinery will be acquired to meet the stringent quality requirements of the Ministry of Defense.

Structural metal products and metal workshops.—

Israel's metal products sector, with 432 manufacturers in 1970, included both subcontractors for the Ministry of Defense and the companies involved in the country's building industry. Many small workshops were formed to handle specific jobs for military purposes. These job shops prospered between 1968 and 1972, but in 1973 they had to defer further expansion plans, owing to a slowdown in orders from the Ministry of Defense. The 1973 conflict is expected to cause a new period of growth for the defense subcontractors, who will first attempt to maximize the use of existing machinery and then move to acquire new equipment.

Israel's building industry has been the country's largest nondefense customer for metalworking equipment, but recently there has been an almost complete cessation of all building activity. However, the longstanding demand for housing, particularly for immigrants, cannot be stifled indefinitely, and expansion and new capital expenditures are expected in the near future. A surge in the building industry, when it comes, is likely to create a market for metal products on a pre-1973 scale.

The combined capital expenditures of the defense subcontractors and the building trade suppliers are projected to increase by over 19% annually during the 1974-78 period, rising from \$9.5 million to over \$19 million. This represents a reversal from the previous 4 years, when expenditures declined from the 1970 level of \$10.9 million. The sector's consumption of metalworking equipment—\$7 million in 1972—is expected to drop to a low of \$2.4 million in 1974 because of the uncertain military climate, and then rally to an estimated \$12 million in 1978.

The types of equipment that will be in demand from U.S. manufacturers are as follows:

- Drilling machines
- Grinding machines
 - cylindrical
 - tool and cutter
- Lathes
- Bending and forming machines

Industrial and building machinery industry.—The 125 manufacturers in the sector in 1970 included both producers of machinery for the building trades and producers of equipment for food processing and

Table 5.—Israel: Capital expenditures of principal end-users of metalworking and finishing equipment, by industry sector, 1970, estimated 1974 and 1978
(in millions of U.S. dollars)

Sector	1970	1974	1978
1. Manufacture and repair of maritime and aircraft equipment	12.2	35.71	59.52
2. Structural metal products and metal workshops	10.9	9.52	19.04
3. Industrial and building machinery	7.2	11.90	21.42
4. Communications, electronic equipment and consumer electronics	5.6	7.14	19.04
5. Home appliances	3.9	4.76	11.90
6. Manufacture of cars, motorcycles, and parts	3.0	2.38	7.14
7. Tinware products	2.8	2.38	4.76
8. Metal products	1.5	1.19	3.57
9. Pumps, compressors, pumping and water desalinization equipment	1.3	1.19	3.57
10. Precision, optical, and photographic equipment	1.3	4.76	7.14
Total	49.7	80.93	157.10

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Israeli statistics and trade source estimates.

packing industries, pharmaceutical plants, and plastics factories. Approximately 30 establishments fabricate agricultural machinery, mainly soil evaporation machines, fertilizing equipment, irrigation equipment, dairy machinery, and equipment for poultry farming.

Many of the firms in this sector are oriented toward the international market. Through the Turn-Key Projects, Israeli manufacturers have exported entire enterprises, mainly to developing countries, in addition to conventional equipment sales abroad. Successful Turn-Key Project exports have included plants to manufacture agricultural and irrigation equipment, and machinery for food processing. Israel often supplies the technical knowledge, the raw materials, and the necessary capital inputs.

The sector's capital expenditures grew from a 1970 base of \$7.2 million to an estimated \$11.9 million in 1974 and are expected to nearly double in 1978, when they should top \$21 million. Because both Israel's building industry and its agricultural endeavors face a continuous shortage of labor, further mechanization of these enterprises is considered necessary and imminent. Manufacturers of building and industrial machinery have made recent investments to meet the growing demand for labor-saving equipment. Producers also expect to find substantial export markets for their advanced equipment, particularly for agricultural machinery.

Although the sector's purchases of metalworking equipment likely will decline from \$6 million in 1972 to \$3.8 million in 1974, due to the political and military climate, consumption is expected to climb to \$9 million in 1978. Manufacturers will need to buy advanced MFE if they are to produce the high-performance machinery now in demand by their major customers. The following U.S.-made equipment should sell well over the next several years:

- Planing, shaping, and broaching machines
- Sawing, filing, and cutoff machines
- Tapping machines
- Punching machines
- Drilling machines

Communications, electronic equipment, and consumer electronics industry.—Israel's electronics industry has experienced rapid growth since 1967, when defense needs created large-scale demands for communications and other electronic equipment. Also, the growing consumer goods market has spurred increased production of radios, phonographs and other consumer electronics items. The sector's annual shipments rose from only \$29.8 million in 1967 to \$85 million in 1970. Diverse types of products are now fabricated domestically. These include the following line communications equipment: standard dial, push-button or voice amplifier receivers, mobile and marine telephone units, speech scramblers, and teletype terminals. Among the types of communications systems produced are urban exchanges, short- and long-haul interexchange lines, and multichannel telegraph terminals. In addition, radio communications equipment, microwave communications equipment, control systems and instrumentation, medical and scientific equipment, and electronic components are manufactured in Israel.

The sector is expected to continue to expand. Output of electronics and communications equipment is projected to increase by 15% annually for the next several years and capital expenditures are expected to rise by nearly 29% a year, the latter climbing from about \$7 million in 1974 to exceed \$19 million in 1978.

Purchases of metalworking equipment by the sector should double during the 1974-78 period, rising from \$5 million to approximately \$10 million. This sector, which utilizes the latest technology available in its production operations, will need a range of advanced machinery from U.S. suppliers, including the following:

- Drilling machines
- Milling machines
- Polishing, lapping, honing, and finishing machines
- Inspection, measuring, and testing equipment

Home appliances industry.—The 102 manufacturers of home appliances in Israel offer both durable and nondurable consumer goods. The general rise

in the standard of living in the country has provided a boost to this sector, and its annual shipments are expected to expand from \$107 million in 1974 to nearly \$143 million in 1978. The largest firms, Amcor, Friedman-Jerusalem, and Electra, have been expanding their production facilities to meet rising domestic demand and, to a lesser extent, to increase exports. Electra, for example, plans to sell 60% of its output of air conditioners abroad. Only \$2.5 million worth of all metal consumer goods made in Israel was exported in 1972, however, and most production will continue to be oriented toward filling domestic requirements.

Although Israel witnessed a temporary lull in this industry, as a result of the "October War," the continued rise in the nation's standard of living should lead to additional investments in production of consumer goods in the near future. Capital expenditures, which grew only moderately from \$3.9 million in 1970 to \$4.8 million in 1974, should more than double to nearly \$12 million in 1978. Purchases of metalworking equipment should also double from \$2 million to \$4 million during the 1974-78 period. The following types of equipment are expected to be in demand from U.S. suppliers:

- Drilling machines
- Milling machines
- Lapping and finishing machines
- Sawing machines
- Punching and shearing machines

Domestic Manufacture of Metalworking and Finishing Equipment

The 15 manufacturers engaged in the production of metalworking equipment in Israel achieved production valued at \$38.8 million in 1972. Efforts to make the country more self-sufficient in conventional machine tools brought domestic output to an estimated \$63 million level in 1974 and should boost it to \$82 million in 1978. Producers in Israel offer only a limited range of basic metalworking equipment, including lathes, presses, guillotines, and tools and accessories for machine tools. Exports of these items in 1978 are predicted to amount to \$15 million, up from \$5 million in 1972.

The major manufacturers of metalworking equipment are Haroshet Hadassa, Middle East Manufacturing Co., Ltd., Koor Metal Works, Ltd. (Simat), M. Maximov, Ltd., and ETM Ltd. None of the local firms is a subsidiary of any foreign concern. One company, Kulso, Ltd., a manufacturer of special carbide tools, is a division of the U.S. firm Kulicke & Soffa Industries. Most Israeli producers, however, have technical agreements with foreign MFE manufacturers. The large companies have used technical knowledge provided by foreign concerns to fabricate more sophisticated products.

Trade Regulations and Practices

Imported metalworking and finishing equipment is distributed in Israel both directly to the end-user from the foreign supplier and through agents of importers. Importers handle the largest volume of metalworking equipment and often arrange all aspects involved in purchasing foreign-made machinery (e.g., transportation, storage, and service).

Imports in Israel are financed by the customer, through government loans, special funds, or commercial banks. Approved Enterprises are entitled to government loans on special terms. End-users which are also exporters may borrow from the Fund for Financing Imports Enabling Exports. Additional governmental sources for financing imports are the Fund for Working Capital in Industry and the General Fund for Special-Purpose Financing. By law, importers in Israel who act as distributors are not allowed to participate in financing imported equipment purchased by their customers.

The high rates of interest in Israel, in mid-1974 up to and beyond 22% per annum, have been caused in part by the strong demand for capital for short-term investments and purchases of durable goods before the October 1973 hostilities. The war brought about a special shortage of available capital because of the government's announced moratorium on debts and because of the resultant general economic slowdown, compounding the difficulties of obtaining credit. However, these effects appear to have been temporary.

Tariff rates applicable to imported metalworking and finishing equipment from the United States range from 10% to 50%. Israel has reduced tariffs on imported goods from Common Market countries but has maintained those on products from the United States at the old levels.

Information concerning official duty rates applicable to specific products within the product category may be obtained from the Domestic and International Business Administration, Room 4127, Main Commerce Building, U.S. Department of Commerce, Washington, D.C. 20230.

Technical Requirements

Israel has no special regulations governing the production and the use of metalworking equipment. The Israel Standards Institutions, Ramat Aviv, Tel-Aviv, issues general standards for machinery and equipment. U.S. standards are acceptable in Israel.

Electric power is provided by the Israel Electric Corporation, which yields alternating current, 50 hertz frequency. The standard voltage for single-phase supply (2-wire system) is 230 volts; for 3-phase supply (4-wire system), 400 volts between each phase and neutral. The supply is either single- or 3-phase for lighting and apparatus not exceeding

3 kilovoltamperes (kVA), and for motors up to 1 horsepower. For all heavier loads, 3-phase is mandatory. For demands exceeding 630 kVA, supply is available at tensions of 6.3, 12.6, 110, or 150 kVA, depending on location. A label stating electrical characteristics on a metal plate is required to be fixed to the back of the equipment in a visible place. This is the general requirement for all equipment and instruments used in Israel.

The metric system is the official system of weights and measures, and customers prefer equipment calibrated in this system.

Published national standards for metalworking

and metal finishing equipment in Israel may be obtained through the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230:

"The Market for Metalworking and Finishing Equipment in Israel," DIB 74-06-502, January 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Israel. The table gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by Israel in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Israel: Imports of selected items of metalworking and finishing equipment, 1968-78, alternate years

(in millions of U.S. dollars)

Type of Equipment	1968	1970	1972	1974	1976	1978
<i>Metalworking Equipment:</i>						
Lathes for working metals	3.262	4.458	2.786	2.00	3.00	4.00
Eyeletting, riveting machines .....	.031	.043	.063	.05	.07	.10
Mechanical appliances for producing electric wire, cables, etc., n.e.s. ....	.336	.186	.527	.40	.80	1.00
Steel or iron hammers .....	.044	.090	—	.05	.05	.08
Converters, ladles, etc., for foundry .....	.193	.383	.238	.30	.80	1.00
Rolling mills	1.256	.185	.238	.50	1.00	1.00
Machines for bending, straightening or cutting iron, steel, rods and strips for construction .....	.055	.452	.239	.20	.40	.50
Moulds .....	.285	.669	1.494	1.00	1.50	1.80
Gas appliances for welding, etc. ....	.237	.208	.175	.10	.15	.20
Electrical metal welding apparatus, etc.	1.024	1.672	1.565	1.20	1.50	2.00
Machine tools not operated by motor .....	.059	.145	.104	.10	.20	.20
Machine tools for working metal, n.e.s.	6.918	18.008	13.902	10.00	10.00	10.00
<i>Parts, Accessories, Tools, and Dies for Metalworking Equipment:</i>						
Parts for rolling mills, rolls .....	.288	.272	.380	.30	.50	.80
Parts of machine tool to work metal, etc. ....	.804	1.637	1.581	1.00	1.40	1.70
Band and endless sawblades .....	.118	.175	.132	.10	.20	.20
Circular sawblades .....	.112	.312	.310	.20	.30	.30
Toothless sawblades .....	.090	.060	.101	.10	.10	.10
Sawblades .....	.025	.033	.033	.03	.04	.04
Interchangeable files .....	.012	.024	.013	.01	.01	.01
Blades for cutting metal .....	.028	.040	—	.01	.01	.01
Appliances to test properties of industrial materials .....	.129	.464	.265	.20	.20	.20
Parts for appliances to test properties of industrial materials .....	.011	.130	.020	.01	.01	.02
Pressure gauges .....	.099	.246	.649	.40	.09	.12
Measuring, checking instruments, optical .....	.050	.077	.033	.02	.04	.10
Measuring and checking instruments, nonoptical .....	.230	.409	.397	.20	.40	.50
Parts for measuring and test instruments, etc.	1.645	6.190	2.311	2.00	3.00	5.00
<i>Metal Finishing Equipment:</i>						
Machines for cleaning metal articles .....	.160	.361	.410	.30	.60	1.00
(Estimate) metal parts deburring machines .....	.200	.257	.286	.20	.20	.50
(Estimate) metal parts hardening machines .....	.429	.571	.583	.40	.60	1.00
(Estimate) metal parts painting machines .....	.371	.428	.476	.40	.50	.50
(Estimate) metal parts plating machines .....	.243	.257	.262	.20	.20	.30

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Israeli statistics and trade source estimates.

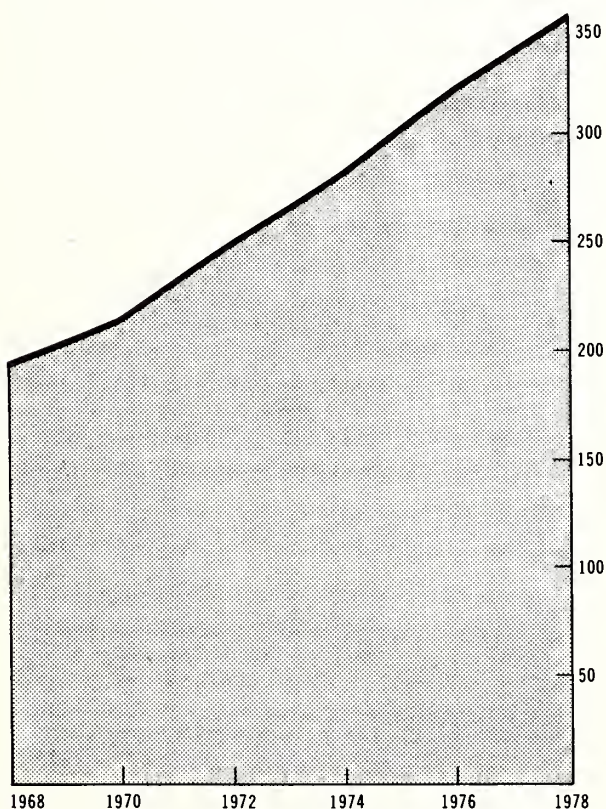
Italy

Beset by steep rises in production costs, stemming from wage increases as high as 20% per year since 1969, Italian businessmen are stepping up their purchases of automated machinery. The trend toward a more widespread utilization of advanced, laborsaving machinery should have a strong impact on Italy's market for metalworking and finishing equipment (MFE).

Because production statistics are not available in Italy for machine tool parts, accessories,

Italy: Consumption of metalworking machine tools, 1968-1978, alternate years

(in millions of U.S. dollars)



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Italian trade source estimates.

tools and dies, metal finishing equipment, and other metalworking machinery, the total market size for metalworking and finishing equipment cannot be determined. Even so, consumption of metalworking machine tools and trade data on other segments of the market give a good indication of overall trends.

The market for metalworking machine tools¹ rose from \$250 million in 1972 to \$283 million in 1974, a 13%² gain (see table 1). Purchases of metalworking machine tools are expected to advance at an average annual rate of approximately 6% during the 1974-78 period, reaching \$357 million.

The country's total imports of metalworking and finishing equipment increased by nearly 5% annually from 1972 to 1974, rising from \$205.4 million to \$234.8 million (see Appendix). Certain sophisticated MFE items, not readily available locally but in constantly greater demand, will doubtless continue to be purchased from foreign countries. Imports are expected to approach \$302 million in 1978—representing an average growth rate of 6.4% a year during the 1974-78 period.

Imports of metal cutting machine tools are expected to reach \$134 million in 1978, up from \$104.3 million in 1974. In the same years, purchases of metal forming equipment from abroad also are projected to expand, climbing to \$58.4 million from \$48.5 million. The Italian import market for

¹ The term metalworking machine tools refers only to metal cutting machine tools and metal forming machine tools; it does not include machine tool parts, accessories, tools and dies, other metalworking equipment, or metal finishing equipment.

² In order to present a more accurate picture, growth rates have been calculated from local currency values. This eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	Lira/U.S. \$1
1968-70	625
1972	583
1974-78	565

machine tool parts, accessories, and tools and dies is predicted to approach \$75 million in 1978, representing an 8% average annual increase from an estimated \$57.1-million level in 1974. A significant and growing market for metal finishing machinery has emerged in Italy; imports have steadily ascended from \$10.6 million in 1972 to an estimated \$14.3 million in 1974, and a \$19.5-million level is anticipated for 1978.

The United States has been one of Italy's leading foreign suppliers of metalworking and finishing equipment. In 1972, Italy's purchases of American-made MFE totaled \$20 million, a 9.7% share of that year's import market (see table 2). Although the U.S. share in 1972 represented a decline from previous years, the United States could achieve 1976 imports in excess of \$33 million, or a better than 12% market share.

Germany, with a 44% share of imports, was Italy's largest foreign supplier in 1972. Switzerland and France each provided about 8%, while the United Kingdom followed closely with a 7% market share.

Germany provided \$36.1 million worth of metal cutting machine tools in 1972, France \$10.4 million, Switzerland \$9.9 million, and the United States \$9.2 million. In the 1972 import market for metal forming equipment, the United States held a 10% share, more than any other single foreign supplier except Germany, which claimed a 55% share.

Sales Opportunities

A market research study recently conducted in Italy for the U.S. Department of Commerce, Office of International Marketing, revealed widespread interest in a broad range of U.S.-made metalworking and finishing equipment. Analysis of trade statistics and interviews with major MFE end-users indicated types of equipment for which American exporters should find particularly promising sales opportunities.

Numerically controlled machine tools.—The trend in Italian industry to reduce production costs by installing more fully automated machinery has provided a sharp boost to the market for numerically controlled (NC) metalworking equipment. Although statistics on total market size are not available, trade data give a good indication of the rapidly rising level of demand. Purchases of foreign-made NC equipment are expected to expand by almost 7% annually, rising from \$10.9 million to reach \$16.7 million during the 1972-78 period.

As one of Italy's leading suppliers in this market in 1972, the United States provided over \$1.4 mil-

Table 1.—Italy: The market for metalworking and finishing equipment, 1968, 1972, 1974, and 1978 (in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Other metal cutting and forming machine tools ¹	Machine tool parts, dies ²	Metal finishing equipment ²	Other metalworking equipment ²	Total
1968							
Production	132.4	66.8	38.0	—	—	—	237.2
Imports	56.3	18.2	—	14.0	3.3	4.4	96.2
Exports	87.4	32.3	—	28.0	2.6	10.4	160.7
1972							
Production	172.2	78.3	83.6	—	—	—	334.1
Imports	93.9	42.0	—	49.1	10.6	9.8	205.4
Exports	150.4	69.2	—	55.8	10.2	18.5	304.1
1974							
Production	200.4	91.4	91.1	—	—	—	382.9
Imports	104.3	48.5	—	57.1	14.3	10.6	234.8
Exports	168.5	84.2	—	68.2	12.7	21.6	355.2
1978							
Production	267.4	120.8	122.7	—	—	—	510.9
Imports	134.2	58.4	—	74.8	19.5	15.0	301.9
Exports	238.4	107.9	—	99.2	17.3	30.2	493.0

¹ Italian production statistics do not separate certain metalworking machine tools into metal cutting and metal forming types.

² Production data not available.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and Italian trade source estimates.

lion, or 13% of imports. The country's purchases of American-made machinery should more than double by 1978, rising to \$3 million. Germany was the largest foreign supplier in 1972, holding 29% of the import market. The United Kingdom and France had shares of 15% and 14%, respectively.

Domestic manufacturers of NC equipment include Olivetti Controllo Numerico SpA, Elettronica San Giorgio—Elsag SpA, Ceruti SpA, and Innocenti Santeustacchio SpA. Italy's exports of NC machine tools have increased appreciably, from \$9.4 million in 1970 to \$11.7 million in 1972, reflecting the overall expansion of production in the past several years. NC drilling and milling machines, NC jig boring equipment, and NC automatic lathes account for 75% of the country's exports of numerically controlled equipment.

The technology for NC equipment has had widespread acceptance throughout Italian industry. The largest end-users are the machine tool manufacturers, which account for 19% of the NC machine tools now in use, and the aerospace industry, which utilizes 11%. Electrical engineering concerns account for 8% of installed NC equipment, as also do the motor vehicle manufacturers. Since most Italian companies regard numerical controls as an excellent investment, the market should continue to be strong over the next few years. In particular demand from American manufacturers are the following:

- NC drilling machines
- NC milling machines
- NC grinding machines with micrometric adjustment
- NC planer milling machines
- NC turret lathes

An analysis of the market for NC machinery reveals that 1978 imports of milling machine tools with numerical controls could amount to \$3.7 million, a 42% increase over the \$2.6-million level of 1972. The United States, which provided \$665,000 of NC milling machines to Italy in 1972, can expect increased sales in the near future. A small market for NC planer milling equipment is emerging, and imports may increase significantly by 1978.

American manufacturers held only a marginal share of the \$3.3-million import market for numerically controlled (NC) lathes in 1972. Italy's largest foreign supplier in that year was Germany, which provided \$1.6 million worth. Imports of NC lathes are expected to total \$10 million in 1978, and since American-made machinery is well regarded in Italy, the United States could increase its share of this market. Imports of NC grinding machine tools with micrometric adjustment totaled \$2.1 million in 1972 and should expand moderately, reaching \$2.5 million in 1978. The United States provided 30% of this import market in 1972.

Although Italian customers show decided preference for new numerically controlled machine tools, they are also interested in retrofitting with NC controls and digital readouts for use in machining centers, automatic lathes, and drilling and milling equipment. Ceruti SpA and Innocenti Santeustacchio SpA are two domestic manufacturers currently making NC controls for retrofitting. These firms also offer digital readouts for both new machines and alterations to existing machinery. A number of end-users have already implemented digital readouts in their manufacturing processes, and demand for such equipment is expected to be strong in the future.

Automatic lathes.—Italy relies upon foreign suppliers for some 50% of its requirements for automatic lathes. Imports, valued at \$21 million in 1972, are expected to increase by an average 8% annually, approaching \$39 million in 1978. U.S. manufacturers claimed a 17% market share in 1972, when purchases of American-made automatic lathes amounted to \$3.6 million. Imports from the United States are projected to rise faster than the market as a whole, expanding by an average of 11% a year during the 1972-78 period to reach nearly \$7 million.

Domestic production of all types of lathes—automatic and nonautomatic—totaled almost \$58 million in 1970, the latest year for which data are available. Italy's exports of lathes in 1970 were valued at \$29 million, of which roughly 17% represented sales of automatic turning machines. The leading local manu-

Table 2.—Italy: Imports of metalworking and finishing equipment from selected countries, 1972
(in millions of U.S. dollars)

Equipment	U.S.	Germany	Switzerland	France	U.K.	Japan	Other	Total
Metal cutting machine tools	9.2	36.1	9.9	10.4	7.3	.6	20.4	93.9
Metal forming machine tools	4.0	23.0	2.5	2.7	2.1	.3	7.4	42.0
Subtotal, metalworking equipment	13.2	59.1	12.4	13.1	9.4	.9	27.8	135.9
Machine tool parts, accessories, tools and dies	3.3	25.7	—	2.7	3.7	—	13.7	49.1
Metal finishing equipment	1.9	4.3	.2	.9	.8	—	2.5	10.6
Other	1.6	1.8	4.8	.3	.4	.1	.8	9.8
Total	20.0	90.9	17.4	17.0	14.3	1.0	44.8	205.4

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics.

facturers are Ceruti SpA, Giustina & C SpA, Graziano & C SpA, Maxnova SpA, Minganti Giuseppe & C SpA, Morando, and Streparava SrL.

American manufacturers of automatic lathes maintain a strong competitive position in relation to other large foreign suppliers. France, Switzerland, and Germany have each held only about 10% of the import market. Sales of U.S.-made machinery should continue to be brisk, with the following types in high demand:

- Automatic bar, multiple-spindle, horizontal lathes
- Automatic chucking, multiple-spindle, horizontal and vertical lathes
- Automatic bar single-spindle lathes
- Automatic chucking, single-spindle lathes

An analysis of the Italian import market for automatic lathes reveals that \$8 million of automatic and multispindle lathes was purchased in 1972. Imports are anticipated to be about \$13 million in 1978. An additional \$5 million was spent in 1972 on single-spindle automatic turret lathes, and this import market should top \$7 million in 1978. Investments in automatic turret lathes from the United States, amounting to \$3.5 million in 1972, should climb with the expansion of the market.

Mechanical presses.—Italian imports of mechanical presses, which account for approximately 25% of the total market, are expected to increase from \$15.4 million to over \$31 million during the 1972-78 period. Imports from the United States, totaling \$1.7 million in 1972, should climb at an average yearly rate of nearly 12% through 1978, when purchases of mechanical presses from American firms are expected to reach \$3.4 million.

Italian manufacturers of all types of presses achieved an output of \$64.5 million in 1970. Exports of mechanical presses alone amounted to \$20.9 million in that year. Dellavia Luigi & C SpA, Emanuel Presse SpA, Fmi Mecfond Aziende Macchinica Revnite SpA, Galbadini Cesare SpA, Innocenti Santeustacchio SpA, and Rovetta Presse SpA are the major domestic producers.

Germany offers the sharpest foreign competition in this type of equipment, having held a 50% share of the 1972 import market. Switzerland, France, The Netherlands, and Japan all provided small quantities of mechanical presses to Italy in that year.

Best sales opportunities for American manufacturers include the following types of presses:

- Horizontal presses
- Vertical presses
- Transfer presses
- Pneumatic presses
- Numerically controlled presses
- Automatic presses

Sharpening, lapping, polishing, and grinding machine tools.—Italian users of these types of machine

tools fill virtually 50% of their total needs from abroad. Imports are expected to show an average annual increase of 5% during the 1972-78 period, rising from \$26.9 million to \$37 million.

The U.S. share of the import market, which has averaged about 15%, declined to 9% in 1972. Renewed demand for American-made products should, however, assist U.S. firms in improving their position in this market, and projections for sales point to a minimum of \$3.9 million in 1978.

The United States faces keen competition from both Italian and other European suppliers. Germany led the 1972 market, with 45% of imports, followed by France and Switzerland with about 10% each. Domestic output of sharpening, grinding, and similar machine tools was valued at \$40 million in 1970. The most important domestic manufacturers include Bertoni & Cotti SpA, Giustina & C SpA, Meccanica Nova SpA, Oerlikon Italiana SpA, S.A.I.M.P. SpA, Facchella Macchine SpA, and Zocca Gaetano SpA.

American-made machinery imports should be bolstered by strong demand for the following items:

- External, universal grinding machines with micrometric adjustment
- Sharpening, lapping, and grinding machines without micrometric adjustment
- Surface grinding machines
- Internal grinding machines

Imports of external, universal grinding machines with micrometric adjustment are projected to expand from \$5.6 million to \$8 million between 1972 and 1978; for the same years, respectively, purchases of foreign-made lapping and polishing equipment without micrometric adjustment are expected to increase from \$2.7 million to \$3.7 million. Imports of internal grinding machine tools with micrometric adjustment are predicted to climb nearly 40% over their 1972 level to reach \$3.7 million in 1978.

Gear cutting machine tools.—Foreign manufacturers supply 50% of the Italian market for gear cutting equipment. Imports, valued at \$4.2 million in 1972, are expected to increase to nearly \$8 million in 1978, a growth rate of about 11% annually. Germany, holding a 65% market share, was the largest foreign supplier in 1972. American manufacturers of gear cutting machine tools are highly regarded in Italy and have accounted for 35% of the import market in the past. Although the U.S. share dropped to 21% in 1972, the decline is expected to be temporary and purchases of American-made machinery are anticipated to reach \$2.8 million in 1978.

The following types of gear cutting machine tools are in demand from American manufacturers:

- Bevel gear cutting machines
- Gear grinding machines
- Gear honing machines
- Gear shaping machines
- Hobbing machines

Domestic production amounted to \$3.8 million in 1970. Prominent Italian producers of gear cutting machinery include Daldi & Matteucci SpA, Induma SpA, P.T.P. SpA, S.I.C.M.A.T. SpA, and Tacchella Macchine SpA.

Other sales possibilities.—U.S. manufacturers should find good sales possibilities for a variety of other types of machine tools. The American share of the 1972 import market for die casting machines, valued at \$5 million, was 32%. The sizable market for nonautomatic lathes, imports of which amounted to \$9.1 million in 1972, could attract more U.S. exporters, who have already achieved some penetration of this market. The United States provided 11% of the country's imports of drilling and boring machine tools (not numerically controlled) and 9% of honing machine tool imports in 1972. American manufacturers captured one-third of the small import market for broaching equipment and can expect to increase sales with the anticipated expansion of the market. The market for foreign-made hydraulic presses looks promising for American manufacturers, which supplied 6% of a total \$4.9 million of imports in 1972.

Italian demand for electrical discharge machines (EDM) and electrochemical machines (ECM) is limited to only a few end-users. These types of equipment are presently being used only for specific applications and mainly in the production of small, complex parts.

End-user Industries

Italy's end-users of metalworking and finishing equipment realized \$9.4 billion in shipments during 1969 (see table 3). In the same year, their combined capital expenditures amounted to \$833 million. The 10 principal end-user industries accounted for 91% of shipments in 1969 and nearly 99% of investment.

Motor vehicles.—Italy's motor vehicle industry has grown rapidly in the past decade and is presently the largest industry sector in terms of investment. Manufacturers' capital expenditures increased by 25% annually during the 1965-69 period, climbing

Major end-user firms and prospective customers in Italy for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—Italy*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Table 3.—Italy: Principal end-users of metalworking and finishing equipment, by industry sector, 1969 (in millions of U.S. dollars)

Sector	Value of shipments	Value of capital expenditures
Motor vehicles	2576.0	311.9
Nonelectrical machinery	2486.0	122.5
Household appliances	1825.6 ¹	95.9
Electronics and communications equipment	1	80.0
Instruments, watches and clocks	1	65.5
Industrial electrical machinery	—	56.7
Fabricated metal products	474.9	41.0
Metal and woodworking machines	303.5	20.8
Shipbuilding	339.1	15.0
Agricultural machinery	511.9	11.9
Subtotal 10 sectors	8517.0	821.2
Subtotal all other sectors	860.2	11.4
Total all end users	9377.2	832.6

¹ The combined value of shipments for household appliances; electronics and communications equipment; and instruments, watches and clocks was \$1,825.6 million.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

to \$311.9 million, and the number of employees rose from 125,000 to 173,000.

The industry produces a range of motor vehicles, including automobiles, commercial vans, buses, trucks, truck trailers, parts and accessories, and gasoline engines for lawnmowers. Shipments reached \$2.6 billion in 1969.

Following years of sustained growth, Italian motor vehicle manufacturers now face a difficult period. Unit production of automobiles increased by only 1.5% from 1971 to 1972, rising from 1,701,064 to 1,732,379. Output of commercial vans declined by 7.4%, dropping from 115,955 units to 107,414 units in the same period. Labor disputes caused automobile production to fall by 14% in the first quarter of 1973; car output for the year climbed by only 5%; reaching 1,823,333 units in 1973. Current sales are below anticipated levels; for example, Fiat's stock of unsold cars as of the spring of 1974 was 150,000 units above normal.

Exports climbed moderately from 1971 to 1972, going from 680,516 units to 699,754 units, a rise of only 2.8%. However, Italy's exports of cars and commercial vans were 20% below expected levels for March 1974.

Product diversification has helped the Italian motor vehicle industry weather the adverse effects of international business cycles. Fiat increased its output of tractors in 1973 by 35% over the previous year, and that of earth-moving machinery by 18%.

Fiat, with over 200,000 employees, is the largest manufacturer of motor vehicles in Italy. Its expenditures for new plants and equipment range from

\$177 million to \$265 million annually. The company plans to build a factory for the manufacture of buses at a projected cost of over \$1 billion. Other automobile manufacturers in the country are Alfa Romeo, with 20,000 employees, and Lancia, with 10,000 workers. Maserati, which employs about 500 people, is a small, highly specialized automobile producer.

The industry has a continuing demand for the latest metalworking and finishing equipment and imports about 22% of such machinery. There is a need to reduce labor costs and to better utilize the enormous range of components used in automobile production. The greater requirements for sophisticated machinery consequently should present American manufacturers with good sales opportunities for the following:

- Machining centers
- Drilling machines
- Lathes
- Boring machines
- Milling machines
- Gear cutting and finishing machinery
- Rotary and line transfer equipment
- Grinding machines
- Presses
- Welding equipment
- Metal parts hardening equipment

Household appliances.—Because Italian manufacturers of domestic appliances have gained a solid reputation internationally for the quality and design of their products, an increasing proportion of their output is exported each year. Approximately 63% of their 1972 production level of \$1.1 billion was exported, compared with a 1968 rate of 58%. In 1974, exports were estimated at \$717.9 million, or 65% of that year's total output.

Electrical household appliances, such as refrigerators, stoves, washing machines, and dishwashers, accounted for over 80% of 1972 output. Production of refrigerators reached 5.4 million units in 1972, and that of washing machines amounted to 2.99 million units.

Dominating the home appliance field in Italy are four companies—Zanussi, Ignis Ire, Indesit, and Merloni & Candi. These firms control over 85% of total production. The industry has been undergoing a period of consolidation. AEG took over Zanussi appliances several years ago and later obtained a 25% share of Zanussi Electrodomec. Philips, a Dutch concern, acquired control of Ignis Ire. With the exception of Indesit, Italian manufacturers of appliances have found it necessary to associate with foreign firms so as to maintain their strong reputation in the world market.

Faced with rising labor costs and near saturation of the domestic market, home appliance manufacturers are looking to a variety of solutions to retain their competitive standing. The Gruppo Industrie

Electrodomecici has been formed to coordinate the activities of three independent producers of washing machines, dishwashers, refrigerators, and stoves. Further consolidations and realignments of medium-size companies should foster expansion and lead to increased demand for sophisticated capital equipment, including metalworking and finishing machinery. The industry currently imports some 11% of its MFE needs. American manufacturers, which are highly regarded in the industry for their laborsaving, cost-reducing products, should become important suppliers of the following items:

- Drilling machines
- Presses
- Welding equipment
- Grinding and polishing machines
- Spinning lathes

Electronic and communications equipment.—Italian output of electronic and communications equipment includes telephone apparatus, electronic components, electronic calculators, teleprinters and terminals, tape recorders, dictating machines, and radio and television transmitting equipment. The sector's capital expenditures amounted to \$80 million in 1969. Capital investment has increased sharply in recent years due to heavy outlays for improving the country's telephone service.

Italy is gradually converting to pulse code modulation circuits for short-distance transmission. Electronic switching is being used on an experimental basis, and the country is expected to adopt fully electronic systems in the near future. The country's telecommunications industry has thus benefited from the surge in investment in new equipment. Output of telecommunications apparatus was valued at \$548 million in 1972, a steep rise from production levels of \$303 million in 1970 and \$260 million in 1968. Annual output probably will exceed \$1 billion in 1977.

The Societa Italiana per l'Esercizio Telefonico (SIP), the national telephone company, invested \$460 million in new equipment in 1972 and approximately \$1 billion in 1973. The SIP's six major suppliers are Societa Italiana Telecomunicazione Siemens SpA, a subsidiary of Siemens AG, FACE Standard, a subsidiary of ITT; GTE Telecomunicazioni SpA, a subsidiary of GT&E; Telettra SpA, a private Italian-owned firm; and two subsidiaries of L. M. Ericsson: Fabbrica Apparechiature Telefoniche e Materiale Elettrica Brevetti Ericsson (FATME), and Impianti Elettrici e Telefonici Sistema Ericsson (SIELTE).

Italy's 1972 output of computers and related equipment was valued at more than \$223 million, a 22% increase over the 1971 level of \$183 million. Of the 1972 total, production of computers amounted to \$154.6 million while that of peripherals was valued at \$68.7 million. The computer industry is

expected to realize a \$600-million production value in 1977.

Although Olivetti launched the Italian computer industry in the 1950's, its computer production was taken over by Honeywell Information Systems Italia SpA. Olivetti recently reentered the field with its Series P600 business computers, but the company's main interest in that area lies in peripherals, terminals, and minicomputers. Olivetti's production is increasingly devoted to electronic equipment of all types, and by 1976 some 66% of its total output is scheduled to be electronic machinery.

Two large organizations—Società Finanziaria Telefonica (STET), a Government concern, and the Montecatini-Edison complex—control the other domestic computer companies.

Italian manufacture of communications equipment, including radio communications equipment, public broadcasting equipment, and radar and navigational aids, had a production value of \$218 million in 1972. About 15% of required MFE is currently imported. Due to substantial expansion in the telecommunications industry and steady growth in other electronics industries, requirements for metalworking and finishing equipment should rise considerably over the next several years. A broad range of machinery will be in demand from American manufacturers, including the following:

- Lathes
- Boring machines
- Drilling machines
- Tapping machines
- Broaching machines
- Grinding and sharpening machines
- Trimming and polishing equipment
- Sawing machines
- Presses
- Riveting and threading equipment
- Shearing machines
- Welding equipment
- Balancing equipment
- Metal parts hardening equipment

Iron and steel.—Sharp increases in the production of steel have been a major factor behind Italy's sustained economic progress since World War II. Between 1958 and 1968, for example, the country's output of steel rose by 10% annually. Despite labor disputes causing temporary slowdowns in production, output rose 6.1% from 19.8 million tons in 1972 to 21.0 million tons in 1973. By 1980, domestic steel consumption is expected to reach some 30 million tons. Substantial investment will be made in the industry to enable it to meet anticipated demand.

The major part of the Italian steel industry is controlled by Finsider, a holding company of the State concern, Istituto per la Ricostruzione Industriale (IRI). The companies comprising Finsider—Dalmine, Italsider, Ternios and Breda Siderurgica—account for over 60% of total steel production.

Finsider produced 98%, or 9.8 million tons, of the country's 1973 output of pig iron and 56%, or 11.6 millions tons, of Italy's crude steel production.

Publicly owned firms produce mostly flat steel or pipes, although recently they have begun making stainless steel and steel tubing. The growth of steel production in the public sector has tended to complement activities in the private sector. There are now some 60 small- or medium-size privately owned companies engaged in steel production in Italy. These firms specialize in all kinds of castings and steel for the construction industry.

Future investment in the sector probably will be concentrated in the public sector and thus will depend upon political considerations. There currently are four integrated steel plants controlled by the Finsider group, each with a capacity of about 2 million tons. The complex at Taranta has just been expanded, and its total production is slated to reach 10.5 million tons by 1976. A fifth integrated steel plant (presently in the planning stages) is to be built in Gioia Taura. The plant will probably install electric arc furnaces and substantial rolling mill capacity.

In the past, an estimated 14% of the sector's MFE consumption has been imported. A broad range of metalworking and finishing equipment will be needed to carry out the steel industry's future expansion plans. American suppliers should find good sales opportunities, particularly for the following items:

- Lathes
- Grinding machines
- Tool sharpening machines
- Grinding and polishing machines
- Sawing equipment
- Presses
- Stamping and forging machinery
- Bending and flattening machines
- Tube and casing forming machines
- Welding equipment
- Metal parts hardening equipment

Other end-users.—A number of other industries in Italy are significant users of metalworking and finishing equipment. Although the Italian aerospace industry is one of the smallest in Europe, it has achieved a good reputation for quality engineering and has made some notable contributions to civil and military aviation. Plans for expansion emphasize international projects such as the Aeritalia Participation in the tripartite Multi-Role Combat Aircraft (MRCA) with the United Kingdom and Germany. Aeritalia is the combination of the aviation interests of Fiat with the aerospace activities of the Finmeccanica Group — Aerfer and Salmioraghi. These concerns are very much interested in the next generation of lightweight fighters for Western Europe and have an agreement with Lockheed, of the United States, on their "Lancer" project. The agreement also

involves the sales promotion of Lockheed's G-222 military transport aircraft in Europe.

Other activities of the Italian aerospace industry include engine production, which is carried out by Alfa-Romeo, Fiat, and Piaggio, under license from British and American companies. Fiat is a member of the European Turbo-Union consortium in association with Rolls-Royce of the U.K. and Motoren-und-Turbinen Union of Germany. Fiat and Alfa-Romeo are engaged in developing the RB-199 engine for the MRCA.

Other large customers for machine tools are Italy's 10 major shipyards, which employ about 25,000 people. In 1973, \$28 million was earmarked for subsidizing the domestic shipbuilding industry. The subsidies provide 10% of the capital investment in shipyard facilities, estimated to total \$200 million over the next 7 years.

More promising customers for metalworking and finishing equipment are manufacturers of agricultural machinery, pumps, air and gas compressors, office machines, and textile machinery. An example is Nuovo Pignone, one of the country's largest manufacturers of high pressure compressors, which presently exports 50% of its output.

Domestic Manufacture of Metalworking and Finishing Equipment

Italian production of metalworking equipment was valued at \$334.1 million in 1972 and is expected to reach nearly \$511 million in 1978. Approximately 180 companies, employing 250 to 300 workers each, manufacture MFE; their output ranges from \$3.5 million to \$8.8 million annually. The machine tool industry reflects the general trend in Italy toward family-owned businesses. These organizations usually endeavor to protect themselves against the adverse effects of business cycles by manufacturing a wide range of products and by exporting.

Although family-owned companies dominate the area of conventional MFE, advanced NC equipment, heavy presses, and machine tools for the steel and heavy industries are mainly produced by a few medium-to-large firms. For example, Olivetti Controlle Numeriche is the industry leader in two machining centers—the horizon and auctor ranges—as well as measurement and control instruments. Olivetti's production amounted to \$24 million in 1973, and about 40% of its output is for export. Olivetti employs some 1,000 people in its new plant at San Bernardo near Ivrea. Another company, Innocenti Santeustacchio, is the country's largest manufacturer of heavy equipment and machine tools. Its product line includes boring, milling, horizontal and vertical turning machine tools, presses, and machines for pipes and plate manufacturing. An estimated 60% of the company's production, most

of which consists of custom-made machinery, is sold abroad.

One of Italy's largest producers of boring machines is Ceruti. Two-thirds of the company's sales, \$8.8 million annually, are made to domestic purchasers. San Rocco, a manufacturer of both boring machines and NC equipment, employs some 250 people and has an annual output of \$6.2 million. Other sizable manufacturers include Duplomatic (milling machines, thread producing machines), Induma (gear cutting machines), and Tacchella Machine (grinding machines).

Exports continue to be stressed by Italian MFE manufacturers, although their rate of increase during the 1972-78 period is expected to be somewhat slower than that experienced from 1968 to 1972. Exports, which totaled \$304 million in 1972, should exceed \$490 million in 1978. The largest export items are sharpening, lapping, and grinding equipment, nonautomatic lathes, mechanical presses, milling machines, and metal bending, folding, and flattening equipment.

Subsidiaries of foreign machine tools manufacturers account for only 4% of total MFE producers in the country. Two American interests are Ex-Cell-O-Corporation's Maxnova SpA, and La Salle Machine Tool Italia SpA, a subsidiary of La Salle Machine Tool. Oerlikon Italiana SIpA is a subsidiary of the Swiss firm, Oerlikon Buhle. Licensing agreements with foreign concerns are more common. Innocenti, for example, is working on an American license for presses and a French license from Berthier for metalcutting machines. Ceruti and Giustina have licensing agreements with American companies, Mecof with Spanish and British firms.

The machine tool industry's trade association, Unione Costruttori Italiani Machine Utensili (UCIMU) includes 150 members which produce 80% of the industry's total output. In addition to providing companies with consultation services, UCIMU maintains its own research center near Milan and has recently established its own finance company, Fincimu, to assist in the sale and production of machine tools.

Trade Regulations and Practices

Italy, as a member of the European Economic Community (EEC), has a tariff structure reflecting the favorable treatment granted to its participants. No duties are assessed on goods coming from the original EEC members (Germany, France, Belgium, The Netherlands and Luxembourg). Duty rates on items imported from the EEC's newest members (United Kingdom, Denmark, and Ireland) are presently 40% lower than those levied on non-EEC members and will decline yearly until eliminated in 1977. Italy also offers preferential duty treatment

to EFTA (European Free Trade Association) members (Sweden, Switzerland, Portugal, Austria, Iceland, Norway, and Finland) identical to that given the recent members of the EEC. Tariffs on machine tools imported from the United States range from 2.5 to 11%. Information concerning official duty rates applicable to specific products may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4127, Main Commerce Building, Washington, D.C. 20230.

Most sales of foreign-made machine tools in Italy are made through import agents. A number of large companies sell their equipment through marketing subsidiaries. In the case of sophisticated machinery, sales are often concluded directly between the foreign manufacturer and the Italian end-user.

Technical Requirements

Italy's electrical power supply characteristics are 220/380 volts, single- or 3-phase, 50 hertz. The metric system of weights and measures is the statutory standard in Italy. Published national standards may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018. Standards for the production and use of metalworking equipment may be obtained from Ente Nazionale Italiano di Unificazione, 2 Piazza Diaz, Milano, Italy.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230: "The Market for Metalworking and Finishing Equipment in Italy," DIB 74-12-501, May 1974.

Appendix

The following tables contain additional information for U.S. businesses that are interested in selling their products in Italy. The tables below give the values in U.S. dollars of various items of metalworking and finishing equipment imported by Italy in 1968, 1970, and 1972 as well as projections, by product subcategory, for the years 1974, 1976, and 1978.

Italy: Imports of metalworking and finishing equipment, 1968¹-72, alternate years

(in millions of U.S. dollars)						
Type of Equipment	1968	1970	1972			
Metal cutting machine tools:				Other metalworking equipment:		
Automatic lathes, NC	—	1.0	3.3	Die casting machines	1.6	1.4 5.0
Automatic lathes and capstan				Parts for die casting machines	1.3	.7 1.1
turret lathes	11.4	18.1	17.8	Other	1.5	2.4 3.7
Nonautomatic lathes	4.5	8.3	9.1	Total	4.4	4.5 9.8
Honing MT, ² NC	—	.8	1.0	Machine tool parts, accessories,		
Honing MT, non-NC	4.5	7.2	3.7	tools and dies:		
Planing MT, NC	—	—	.2	Work holders and tool holders	3.1	3.5 2.9
Planing MT, non-NC .....	.5	.4	.4	Special attachments	1.0	1.4 1.2
Shaping, slotting, etc. MT, NC	—	—	.1	Parts	9.9	13.9 24.0
Shaping, slotting MT, non-NC .....	.6	.5	.8	Bandsaw blades	—	.9 .9
Broaching MT, non-NC .....	.6	.8	.8	Circular sawblades	—	1.6 .9
Sawing, cutting MT	1.6	1.7	3.2	Other sawblades	—	.1 .2
Drilling, milling MT	—	2.5	2.6	Interchangeable drills	—	4.3 3.8
Milling MT, non-NC	9.3	11.4	12.5	Interchangeable milling cutters		
Drilling MT	2.6	3.9	3.6	and heads WPBM	—	2.0 2.4
Sharpening, lapping, grinding, etc.				Interchangeable honing and		
MT with micrometric adjustment,				broaching WPBM	—	.6 .8
non-NC	10.9	16.3	17.2	Interchangeable lathe tools	—	.3 .3
Sharpening, lapping, grinding, etc. MT				Interchangeable gearcutting tools	—	.5 .5
with micrometric adjustment, NC	—	.5	2.1	Interchangeable threading and		
Sharpening, lapping MT without				tapping WPBM	—	2.1 2.2
micrometric adjustment	4.3	6.9	7.5	Interchangeable punches and dies	—	3.2 3.7
Jig boring MT, NC	—	.4	.3	Other interchangeable tools	—	4.1 4.8
Jig boring MT, non-NC	1.5	.8	.5	Interchangeable lathe tools and		
Gear cutting MT, NC	—	.1	—	cutting tools with metal carbide	—	.2 .5
Gear cutting MT, non-NC	3.1	6.3	4.1	Total	14.0	38.7 49.1
Other .....	.9	3.7	3.1	Metal finishing equipment:		
Total	56.3	91.6	93.9	Presses for treating metal	—	1.2 1.3
Metal forming machine tools:				Machines and appliances other than		
Hydraulic presses, NC	—	.5	.6	presses for treating metal	—	1.6 2.7
Nonhydraulic presses, NC	—	.5	.3	Appliances for projecting liquids		
Hydraulic presses, non-NC	2.5	3.6	4.3	and powders .....	.9	2.1 2.4
Nonhydraulic presses, non-NC	6.2	11.0	15.1	Spray guns	1.4	2.4 3.4
Bending, folding, flattening, etc.				Induction and dielectric heating		
MT, NC	—	.2	.3	equipment	1.0	.3 .8
Bending, folding, flattening, etc.				Total	3.3	7.6 10.6
MT, non-NC	3.2	5.1	9.8	Total Metalworking and		
Forging, stamping MT, NC	—	—	.1	Finishing Equipment		
Forging, stamping, MT, non-NC	1.1	.5	1.4		96.2	172.1 205.4
Other	5.2	8.3	10.1	Italy: Imports of metalworking and finish-		
Total	18.2	29.7	42.0	ing equipment; projections for 1974,		
				1976, and 1978		
				(by product subcategory only in millions of U.S. dollars)		
				Type of equipment	1974	1976 1978
				Metal cutting machine tools	104.3	114.9 134.2
				Metal forming machine tools	48.5	54.1 58.4
				Other metalworking equipment	10.6	12.7 15.0
				Machine tools parts, accessories,		
				tools and dies	57.1	68.8 74.8
				Metal finishing equipment	14.3	16.5 19.5
				Total metalworking and		
				finishing equipment	234.8	264.8 301.9

¹ Italian statistics for 1968 do not differentiate between NC and non-NC machinery.

² MT is an abbreviation for machine tools.

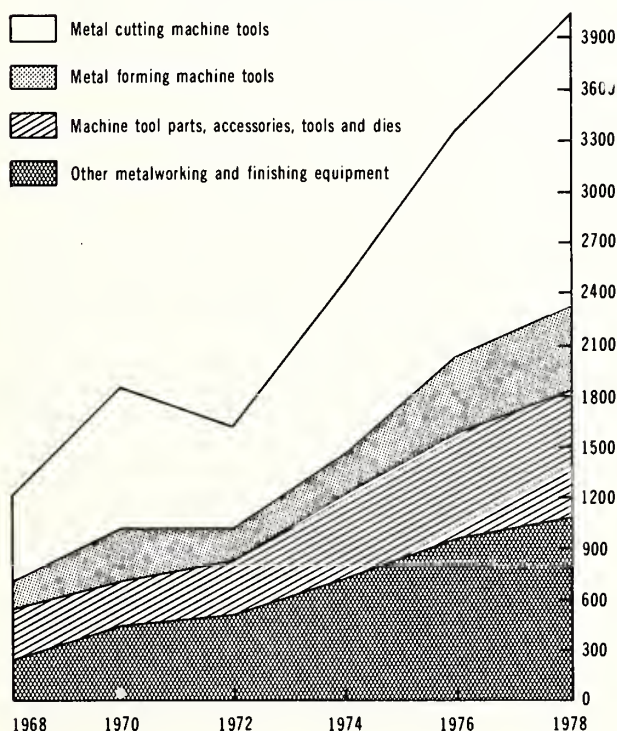
Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Italian official trade statistics and trade source estimates.

Japan

Japan's heavy investment in plant construction and equipment, including machine tools, has been a primary force behind the country's economic growth. Capital investment increased by 13.2%¹ annually from \$39.8 billion in 1970 to \$78.4 billion in 1973; in the same years, gross national product (GNP) more than doubled, going from \$197.2 billion to \$419.1 billion. Japan has recently had to impose monetary restraints in order to curb the rate of inflation, but the economy is expected to be in robust condition again by 1975 or early 1976. Capital

investment is projected to approach \$138 billion in 1978, and GNP should exceed \$861 billion that same year.

Figure 1. — Japan: Consumption of metalworking and finishing equipment, 1968-78, alternate years
(in millions of U.S. dollars)



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Japanese official trade statistics and trade source estimates.

The trend in the size of the market for metalworking and finishing equipment (MFE) closely parallels trends in the economy as a whole, and the market is expected to realize a 13.5% average annual growth rate between 1974 and 1978, rising from \$2.5 billion to exceed \$4 billion (see table 1). During the preceding 2-year period, purchases of metalworking and finishing machinery grew by nearly 14% a year from a 1972 level of \$1.6 billion.

Japan prides itself on having a modern industrial complex, and the metalworking industry is no exception. Manufacturers have been replacing their equipment earlier in its life cycle than they did in the past, and this trend is expected to continue. More than 35% of the machine tools now in use are under 5 years of age and 34.6% are between 6 and 10 years old.

Strong demand for metal cutting machine tools is anticipated. This market is expected to expand by over 15% annually between 1974 and 1978, climbing from almost \$969 million to approach \$2 billion. Purchases also rose by about 15% a year during the 1972-74 period, starting from a base of \$629 million. Imports, which satisfied 12% or \$72.6 million of the metal cutting machinery market in 1972, should approach \$150 million in 1978.

The market for metal forming machine tools is expected to increase to \$553 million in 1978, from

¹ In order to present a more accurate picture, growth rates have been calculated from the local currency values. This eliminates the effect of changes in currency alignments, although the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into dollars:

Year	Y/US\$1.00
1968-70	360.00
1972	308.00
1973-78	265.19

an estimated \$288 million in 1974 and \$200 million in 1972. Imports should nearly double from \$28.1 million in 1972 to over \$54 million in 1978.

Japanese requirements for metal finishing equipment rose at an average annual rate of 14% during the 1972-74 period, starting from a level of \$269.4 million. Consumption is anticipated to expand between 1974 and 1978 at the more moderate rate of slightly over 5% a year, climbing from \$407 million to almost \$500 million. Imports of metal finishing equipment, however, are expected to rise much faster during the 1974-78 period. Japan purchased \$7.6 million worth of imported metal finishing machinery in 1974; purchases in 1978 are forecast to exceed \$13 million, representing an average annual growth rate of 14.4%.

Imports accounted for 7%, or \$125 million, of the 1972 metalworking and finishing equipment

market. Purchases from abroad in 1978 should approach \$247 million, a projected 12.8% annual increase over the 1974 level of \$152.2 million (see Appendix).

The United States is Japan's leading foreign supplier of metalworking and finishing machinery (see table 2). Imports of U.S.-made equipment in 1972 amounted to \$48.8 million or a 39% market share, and are expected to account for at least \$66 million of the 1976 import market.

American exporters face their sharpest foreign competition from German and Swiss suppliers, which held 26.6% and 11.% of the market, respectively, in 1972. Imports from Germany were valued at \$33.2 million in 1972, and those from Switzerland totaled \$14.4 million. Eastern European countries are expected to increase sales of machine tools, primarily conventional equipment, during the next few years.

U.S. suppliers had a wide lead in Japan's 1972 import market for metal cutting machine tools, providing equipment worth \$24.7 million as compared to \$11.4 million from Switzerland and \$7.1 million from Germany. American manufacturers also dominated the 1972 metal forming machine tool import market with a 47% market share, worth \$13.3 million, while Germany supplied 36%. Imports of U.S. metal finishing equipment in 1972 were valued at

Table 1.—Japan: Consumption¹ of metalworking and finishing equipment, 1968, 1972, 1974, and 1978 (in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories, tools and dies	Metal finish- ing equipment	Other	Total
1968						
Production.....	484.4	168.3	226.7	152.8	150.4	1,182.6
Imports.....	94.8	38.2	8.8	2.4	.9	145.1
Exports.....	51.6	11.5	13.2	10.5	---	86.8
Consumption.....	527.6	195.0	222.3	144.7	151.3	1,240.9
1972						
Production.....	648.7	223.0	343.4	287.3	197.2	1,699.6
Imports.....	72.6	28.1	16.1	6.1	1.9	124.8
Exports.....	91.7	51.7	21.3	24.0	---	188.7
Consumption.....	629.6	199.4	338.2	269.4	199.1	1,635.7
1974						
Production.....	1,011.9	337.0	526.7	433.3	285.4	2,594.3
Imports.....	89.9	34.3	18.3	7.6	2.3	152.4
Exports.....	133.2	83.6	32.6	34.0	---	283.4
Consumption.....	968.6	287.7	512.4	406.9	287.7	2,463.3
1978						
Production.....	1,762.3	608.4	776.3	528.7	565.5	4,241.1
Imports.....	149.2	54.2	26.9	13.1	3.2	246.6
Exports.....	192.1	110.1	52.0	42.3	---	396.5
Consumption.....	1,719.4	552.5	751.1	499.5	568.7	4,091.2

¹ Consumption equals production plus imports less exports.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Japanese official trade statistics and trade source estimates.

\$4 million, or 65% of the import market, and should amount to more than \$6 million in 1976.

Sales Opportunities

American manufacturers have enjoyed a technological edge in the Japanese market for metalworking and finishing equipment. Sales of U.S.-made equipment should continue to be brisk despite current restrictions on credit for capital spending in Japan. Major U.S. customers in Japan are large manufacturers, which have access to investment funds even under tight money conditions. These companies need advanced machinery that is not always available domestically, if they are to remain competitive on the international market.

Although Japan is trying to close the technological gap that now exists between American and Japanese manufacturers of a number of types of machine tools, the United States should remain the country's most important source of many sophisticated products for the next several years. A market study recently conducted in Japan for the U.S. Department of Commerce, Office of International Marketing reveals favorable sales opportunities for American manufacturers of the following items.

Forging machines.—The market for forging machines is expected to increase at an average annual rate of 22%, rising from \$14.3 million in 1972 to \$55 million in 1978. Imports of forging machines amounted to \$10.6 million in 1972 and are projected to double to \$21.4 million in 1978. The United States provided 54%, or \$5.7 million, of the 1972 import market.

Germany is the only other major foreign supplier of forging machines. Imports from Germany in 1972 were valued at \$4.5 million, representing a 42.6% market share. Leading German exporters include Beche & Groks, GmbH; Eumuco, Leverkusen; and J.G. Kayser, GmbH.

With the single exception of forging hammers, domestic output of forging machines is limited. It supplied only 20% of the market (exclusive of hammers) in 1972. The two local manufacturers are Amada Company, Ltd., and Aida Engineering, Ltd.

The technological lead now possessed by American manufacturers is expected to continue to maintain strong demand for U.S.-made forging machines during the next several years. Specific types with high sales potential include the following:

- Hydraulic and mechanical forging presses
- Powder-compacting forging presses
- Cold headers
- Hot headers
- Roll forging machines
- Die-casting machines

Japan—Age of Metalworking and Finishing equipment currently in use.

Age of equipment	Percent
less than 5 years old	35.6
6 to 10 years old	34.6
11 to 15 years old	19.4
over 15 years old	10.4
Total	100.0

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

Cylindrical grinding machines.—Japan's market for cylindrical grinding machines is expected to be worth more than \$59 million in 1978, after rising at a projected average annual rate of 8% over the 1972 level of \$31.9 million. American manufacturers are already well established in this market, having supplied 64.7% of 1972 imports, with a total value of \$4.6 million.

High-precision grinding machines from the United States face only limited competition from Japanese products. Although local production is expected to be stronger in the future, U.S. exporters should be able to maintain or even increase their market share over the next several years. Okamoto Machine Tool Works, Ltd.; Toyoda Machine Works, Ltd.; and Mitsubishi Heavy Industries, Ltd., are the three major Japanese manufacturers of cylindrical grinding machines.

The United States also possesses a competitive edge over German and Swiss suppliers because of the more advanced technological development of its grinding machines. Friedrich Schmaltz GmbH, Herbert Lindner GmbH, and Schaudt Maschinenbau GmbH are the most important German suppliers. Wyssbrod is Switzerland's most important exporter of cylindrical grinders to Japan.

The outlook for future sales of U.S.-made cylindrical grinding machines is bright, particularly for the following types of equipment:

- Internal centerless grinding machines
- Internal chucking horizontal grinding machines
- Internal chucking vertical grinding machines
- Internal plain grinding machines

American-made internal grinders are highly regarded in Japan for performance and precision. The country's consumption of internal grinders was \$7.1 million in 1972; this level should nearly double by 1978, climbing to \$13.2 million. In 1972, the United States supplied 41.6% of this total market and 74.9% of imports.

Gear cutting and finishing machines.—Japanese consumption of gear cutting and finishing machines

Table 2.—Japan: Imports of metalworking and finishing equipment, from selected countries, 1972
(in millions of U.S. dollars)

Equipment	U.S.	Germany	Switzerland	U.K.	U.S.S.R.	Italy	Other	Total
Metal cutting machine tools	24.7	17.1	11.4	2.9	3.8	2.0	10.7	72.6
Metal forming machine tools.....	13.3	10.1	.9	1.3	.2	.3	2.0	28.1
Subtotal— metalworking equipment.	38.0	27.2	12.3	4.2	4.0	2.3	12.7	100.7
Machine tool parts, accessories, tools and dies	5.8	4.8	1.8	1.0	—	.2	2.5	16.1
Metal finishing equipment.....	4.0	.8	.3	.3	—	.1	.6	6.1
Other.....	1.0	.4	—	—	—	.2	.3	1.9
Total.....	48.8	33.2	14.4	5.5	4.0	2.8	16.1	124.8

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Japanese official trade statistics.

is anticipated to increase by an average of over 13% a year between 1972 and 1978, rising from \$29.4 million to approach \$72 million. U.S. manufacturers have a strong position in this market and supplied 28.7% of total consumption, or 64.7% of the import market in 1972.

Purchase of gear cutting machines, valued at \$8.4 million in 1972, are projected to reach nearly \$15 million in 1978. The market for gear finishing machines totaled \$6.3 million in 1972 and a level of \$10 million should be reached in 1978.

Domestic manufacturers at present can compete effectively only in the market for hobbing machines, but a number of Japanese companies are trying to offer more sophisticated equipment. These firms are Hitachi Seiki Co., Ltd., Fujikoshi Co., Ltd., Ikegai Iron Works, Ltd., and Howa Sangyo Co., Ltd. Competition from European firms is mainly from Carl Hurth Maschinen & Zahnradfabrik and Maschinenfabrik Lorenz AG, both of Germany, and from two Swiss companies, Wyssbrod and Mang Gee-Wheel Co.

U.S. manufacturers should continue to be Japan's leading suppliers of high-performance gear cutting and finishing machines. The following equipment is expected to have particularly good sales potential for the next 4 years:

- Bevel gear cutting machines
- Gear grinding machines
- Gear tooth chafing and rounding machines
- Gear shaping machines

Transfer, unit, and way type machines.—Japanese purchases of transfer, unit, and way type machines were valued at \$81.2 million in 1972 and are projected to reach almost \$250 million in 1978. A breakdown of this market reveals that sales of single-purpose machines amounted to \$39 million in 1972 and should exceed \$94 million in 1978; sales of multipurpose machines are expected to climb from \$42.3 million to nearly \$155 million in the same years.

Imports of transfer, unit, and way type machines have been limited by lack of demand outside the automotive industry. Increasing labor costs for mass produced items however, are leading Japanese manufacturers to consider purchasing assembly and transfer machines to overcome production problems.

Five technical licensing agreements recently were signed between Japanese and foreign firms, and one joint venture has been concluded between a domestic and an American company. Nevertheless, there is substantial room for direct imports from the U.S. companies who have developed transfer and assembly machines for special and proprietary applications. Transfer systems are relatively new to Japanese companies, and U.S. manufacturers, with their long experience and technological superiority in this area, should profit from Japan's growing need to increase productivity.

U.S. firms can expect good export potential for these products:

- Transfer machines, center column
- Transfer machines, dial (rotary)
- Transfer machines, in-line, pallet or plain
- Transfer machines, trunnion
- Unit head, boring machines
- Unit head, broaching machines
- Unit head, drilling machines
- Unit head, milling machines
- Unit head, tapping machines
- Unit head, turning machines

The three principal domestic manufacturers are Mitsubishi Heavy Industries, Ltd., Mitsui Machine Industries, Ltd., and Enshu Cross K.K. European competition in this area is mostly limited to European-based subsidiaries of U.S. manufacturers, including Ex-Cell-O GmbH and Cross Europe Werk GmbH, both located in Germany.

Numerically controlled machine tools.—Japanese manufacturers are accelerating their purchases of numerically controlled (NC) machine tools in order

Table 3.—Japan: End-users of metalworking and finishing equipment, by industry, 1970

Industry	No. of manufacturers	Value of sales (in millions of U.S. dollars)	Value of capital investment	No. of workers
Iron and steel products.....	5,904	18,659	2,325	580,482
Transportation equipment.....	11,918	21,861	1,768	953,740
Electrical machinery.....	18,392	20,990	1,381	1,400,545
General machinery and equipment.....	32,281	16,697	1,313	1,091,759
Nonferrous metals.....	3,614	8,447	671	223,673
Metal products.....	41,931	9,753	610	789,164
Precision machinery and equipment.....	6,329	2,376	184	233,399
Total.....	120,369	98,783	8,252	5,272,762

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Japanese official trade statistics.

to reduce labor costs. The market is anticipated to realize an average annual growth rate of almost 30% during the 1972-78 period, climbing from \$59.7 million to over \$332 million.

The United States accounted for 25.2% (by value) of Japan's imports of NC machine tools in 1972. The U.S. share of this market has declined recently, mainly because of the increasing competence of domestic producers who often have licensing agreements and/or joint ventures with U.S. manufacturers of this machinery.

Japanese producers have been aggressive in acquiring foreign technology and have given priority to developing NC machine tools in their research and development programs. Major domestic suppliers include Ikegai Iron Works, Ltd.; Toshiba Machine Co., Ltd.; Toyoda Machine Works, Ltd.; Tsugami Corporation; and Okuma Machinery Works, Ltd.

The major European suppliers are Germany, which held 20.1% of the 1972 import market; Switzerland, with an 18.2% market share; and the United Kingdom, with 5%. Three German companies, Carl Hurth Maschinen & Zahnradfabrik, Gebr. Boehringer GmbH, and Gildemeister & Co., AG, sell NC machinery to Japan. George Fisher, Ltd., of Switzerland and Matrix Churchill International, Ltd., of the United Kingdom also are active suppliers.

Despite considerable competition from domestic and European suppliers, American exporters should continue to find considerable sales potential for their NC products in Japan during the foreseeable future. With aggressive promotion, effective distribution channels, and good servicing arrangements, U.S. exports of the following items could increase appreciably:

- NC grinding machines
- NC turning machines
- NC boring machines
- Machining centers
- Special-purpose NC machines

The market for NC boring machines should approach \$47 million in 1978, representing an average yearly increase of nearly 35% over the 1972 consumption of \$6.8 million. Japanese purchases of NC grinding machines are projected to climb by 17% annually, from \$1.5 million in 1972 to over \$5 million in 1978.

Demand also should rise for direct numerically controlled (DNC) and computer numerically controlled (CNC) manufacturing systems. The Japanese machine tool industry has produced a few relatively simple DNC systems during the last several years. However, U.S. capabilities in this field are expanding and Japan is a ready market for new developments and breakthroughs in this technology.

Trade sources suggest that strong sales promotion could help create a healthy market for numerical controls among small- and medium-size companies. The outlook for future sales of digital readout systems and tracer controls could also be promising. Only 7.9% of the NC machines sold in 1972 were equipped with digital readout systems.

Other sales opportunities.—Both electrical discharge machining (EDM) and electrochemical machining (ECM) equipment should be in demand during the next several years. Domestic production of EDM equipment increased steadily from \$14.8 million in 1970 to \$17.5 million in 1972, and it is considered likely that both imports and local production will rise appreciably through 1978. U.S. manufacturers hold a technological edge in this field and should increase their sales of EDM and ECM machinery, especially to manufacturers of dies and complex precision parts.

End-User Industries

Japan had a total of 120,387 companies utilizing metalworking and finishing equipment in 1970. Their level of capital investment reached \$8.3 bil-

lion in 1970, having risen more than 26% yearly over the 1965 level of \$2.5 billion (see table 3). Their combined sales increased from \$36.2 billion to \$98.8 billion during the 1965-70 period.

The largest end-user industries of metalworking machinery in Japan are the general machinery and equipment manufacturers, which accounted for 46.7% of the country's total 1972 machine tool orders, and the transportation equipment manufacturers (including shipbuilders), with 31.6% of that year's orders. Other important customers included the electric machinery and equipment industry and the metal products industry, which placed 6.3% and 5.9%, respectively, of the 1972 orders.

The principal industry sectors which use metalworking and finishing equipment in Japan included 54,827 companies that had shipments valued at \$62 billion and capital investment of over \$5.6 billion as of 1970 (see table 4). As a result of the Japanese Government's policy to control inflation by curbing and/or postponing investments, actual capital expenditures are estimated to have been 21% lower than originally planned during the first 6 months of 1974. Investment programs are expected to return to their "normal" levels by 1975 or 1976, and end-users of MFE are expected to increase their level of investment to beyond \$21 billion in 1978, a more than 17.5% average yearly rise over 1974 levels (see table 5).

Motor vehicle and parts industry.—Japan's motor vehicle and parts sector in 1970 consisted of 8,182 companies, including both the large manufacturers and their small subcontractors. These firms' combined capital investment grew from \$525 million in

1965 to more than \$1.3 billion in 1970. From 1974 to 1978, investment is expected to increase by over 18% a year, rising from \$2.3 billion to over \$4.5 billion.

Investment programs for the remainder of this decade look to development of pollution-free vehicles, further automation of assembly operations, and expansion of plant facilities. The sector will require appreciably more metalworking equipment in order to meet these objectives. With expenditures for metalworking and finishing equipment of \$465 million the sector was the single largest buyer of machine tools in Japan in 1972, accounting for about 28.4% of that year's total domestic consumption. The industry's purchases of metalworking equipment are expected to exceed \$1 billion in 1978, representing a 12.5% yearly increase over an estimated 1974 level of \$702 million.

The following types of U.S.-made metalworking equipment should be in demand by this sector over the next 5 years:

- Gear cutting and finishing machines
- Grinding machines
 - Cylindrical grinding machines
 - Special-purpose grinding machines
- Transfer, unit head, and way type machines
- Hydraulic presses
- Perishable cutting tools
- Forging machines
- Turning machines, special-purpose lathes

Japan's major motor vehicle manufacturers utilize the latest technology in their production operations and continue to purchase the most advanced ma-

Table 4.—Japan: Principal end-users of metalworking and finishing equipment, by industry sector, 1970

Sector	No. of manufacturers	Value of sales (in millions of U.S. dollars)	Capital investment
1. Iron smelting, with blast furnaces	70	9,752	1,626
2. Motor vehicles and parts	8,182	15,377	1,304
3. Communication equipment	2,942	10,247	644
4. Shipbuilding and marine engines	2,729	5,532	393
5. Nonferrous metal, primary smelting	108	2,826	354
6. General industry machinery and equipment	7,445	4,216	338
7. Industrial electric machinery and equipment	5,968	4,335	255
8. Metalworking machinery	6,491	2,995	266
9. Fabricated metal products for construction	15,604	4,186	237
10. Parts for electric appliances and communication equipment	5,288	2,500	226
Subtotal principal sectors	54,827	61,965	5,643
Subtotal all other sectors	65,542	36,818	2,609
Total all end-users	120,369	98,783	8,252

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Japanese official trade statistics.

Major end-user firms and prospective customers in Japan for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment-Japan*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications and trade associations.

chinery available on the market. Many are installing fully mechanized and even computerized production lines. All manufacturers in the sector, both large and small, are keenly aware of the need to utilize labor-saving equipment to offset the labor shortage and escalating wage costs.

General industrial machinery and equipment industry.—The 7,445 companies in this sector produce a broad range of apparatus, including pumps, compressors and blowers, elevators and escalators, conveyors, mechanical power transmission equipment, industrial furnaces and ovens, oil hydraulic equipment, and chemical machinery. Because many of these products are considered essential to Japan's economic growth, the sector's capital expenditures should remain heavy throughout the remainder of this decade. Capital investment increased at an average annual rate of more than 9% from \$338 million in 1970 to an estimated \$654 million in 1974. Manufacturers are expected to increase capital outlays appreciably between 1974 and 1978; invest-

ment should grow by 17.5% a year to reach \$1.2 billion in the latter year.

The sector's 1972 purchases of metalworking machinery amounted to \$196 million, or 12% of the country's total consumption. Purchases of metalworking and finishing equipment are expected to total \$320 million in 1974 and \$572 million in 1978. The following products will be in demand from the United States:

- Gear cutting and finishing machines
- Cylindrical grinding machines
- NC machines
- EDM and ECM machines
- Transfer, unit head, and way type machines
- Hydraulic presses

The large metal parts manufacturers in Japan have achieved a high technological level. Currently, expanding requirements for complex antipollution equipment and other advanced industrial machinery are causing both large and small producers in the sector to seek sophisticated technological know-how from foreign sources and to step up domestic research and development projects.

Metalworking machinery industry.—Although Japan's metalworking machinery industry has managed to close the technological gap between itself and Western manufacturers in many areas of MFE production, it still relies on foreign suppliers for machinery used in the production of high-performance equipment. The sector's total 1974 capital investment is estimated at \$468 million; in 1978, it is expected to reach \$965 million. Purchases of metalworking and finishing machinery, including its own products, were about \$234 million in 1974. Purchases are projected to increase over 13% annually and by 1978 should reach \$388 million. Investment

Table 5.—Japan: Capital investment of principal end-users of metalworking and finishing equipment, 1970, 1974, and 1978
(in millions of U.S. dollars)

Sector	1970	1974	1978
1. Iron smelting, with blast furnaces	1,626	3,229	5,788
2. Motor vehicles and parts	1,304	2,340	4,548
3. Communication equipment	644	1,292	2,481
4. Shipbuilding and marine engines	393	969	2,067
5. Nonferrous metal, primary smelting ...	354	638	1,268
6. General industry machinery and equipment	338	654	1,240
7. Industrial electric machinery and equipment	255	468	1,034
8. Metalworking machinery	266	525	965
9. Fabricated metal products for construction	237	484	1,020
10. Parts for electric appliances and communication equipment	226	500	896
Total	5,643	11,099	21,307

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Japanese official trade statistics and trade source estimates.

plans will give priority to the development of labor-saving and high-precision machinery, especially NC machine tools.

Japanese manufacturers in this sector will require the following products from the United States:

- Cylindrical grinding machines
- NC machine tools
- Milling machines
- EDM and ECM machines
- Perishable cutting tools
- Accessories, attachments, and auxiliary equipment for machine tools

Industrial electric machinery and equipment industry.—The 5,968 companies engaged in manufacturing electric machinery and equipment shipped \$4.3 billion worth of products in 1970. Companies in the sector produce generators and other rotating electrical machinery, transformers, switchgears, switchboards and electrical control equipment, wiring devices, and electrical welding machines.

Capital investment by the industrial electric machinery industry is expected to increase by 17.5% a year during the 1974-78 period, expanding from an estimated \$525 million to over \$1 billion in response to increased demand, both foreign and domestic, for Japan's industrial electric machinery. Before the energy crisis, it was believed that Japan would rely less on hydroelectric power systems and more on gas and/or oil systems. The country now is in the process of reviewing the possibilities of expanding its hydroelectric power generating networks. Domestic demand for related industrial electric machinery should now climb at a fast pace.

The sector accounted for about 3.1% of the total 1972 domestic market for MFE, or \$51 million in purchases. Expenditures on metalworking and finishing machinery are expected to reach \$127 million in 1978, reflecting an almost 14% average annual rise over an estimated \$76 million in 1974. Demand should be strong for the following types of MFE from the United States:

- Cylindrical grinding machines
- Gear cutting and finishing machines
- NC machines
- Automatic turning machines
- Perishable cutting tools

Shipbuilding and marine engine industry.—Shipbuilding is one of Japan's most important industries. Ship tonnage launched by the country in 1972 amounted to 12.9 million tons, or 48.2% of the world's total, making Japan the world's foremost shipbuilding nation. Japanese manufacturers cur-

rently have a backlog of 3 to 5 years and are trying to expand facilities to meet production deadlines and the worldwide demand for larger ships. Capital investment is likely to rise at the impressive rate of over 20% annually, increasing from an estimated \$969 million in 1974 to more than \$2 billion in 1978. This will represent a marked acceleration over the preceding 4-year period—1970-74—when investment rose by 16% a year on the average. Purchases of metalworking and finishing machinery are projected to reach \$123 million in 1978, up from \$74 million in 1974 and \$47 million in 1972.

Japan's shipbuilding industry produces and repairs steel and wooden ships, small boats, and marine engines. It utilizes almost all types of machine tools; the following are expected to be in demand from U.S. manufacturers:

- Gear cutting and finishing machines
- Cylindrical grinding machines
- NC machines
- Lathes
- Hydraulic and mechanical presses, large capacity
- Cutting tools
- Forging machines

Domestic Manufacture of Metalworking and Finishing Equipment

Japan's metalworking and finishing machinery industry comprised 6,202 firms in 1970. There are 305 companies with 100 employees or more, and they account for 70% of the output. The industry was particularly hard hit by an economic slowdown in 1972 which resulted in price wars between manufacturers. Since that time, the major producers and affiliated trading firms have begun to work toward cooperation in the hope of stabilizing prices. To date, however, the industry remains highly competitive.

Domestic manufacturers registered a high level of backlog orders in 1973. Although the present curbs on investment spending are likely to cause a temporary decline in new orders of machine tools by late 1974, they should be partially offset by Japanese eagerness to install advanced machinery.

Japan produces a wide variety of metalworking and finishing equipment; output amounted to \$1.7 billion in 1972 and is expected to reach \$4 billion in 1978. Exports, which consist mostly of conventional machine tools, continue to rise and are projected to approach \$400 million in 1978, climbing from \$189 million in 1972.

There is as yet no wholly foreign-owned subsidiary manufacturing machine tools in Japan.

Direct foreign investment is expected to increase, however, now that the Government has liberalized its policy on foreign capital investment in the industry and allows foreign concerns to wholly own their subsidiaries.

The Japanese MFE industry has been and probably will continue to be highly dependent upon foreign technology. Local manufacturers have aggressively sought licensing agreements with foreign companies, and a total of 206 such agreements had been concluded at the beginning of 1974. More than half of these (112) were between Japanese and American manufacturers of metalworking equipment. In addition, nine joint-venture companies have been established between Japanese and U.S. interests. These companies also manufacture MFE under license from the United States and act as agents for the distribution of imported machinery produced by their American counterparts.

Trade Regulations and Practices

Metalworking and finishing equipment imported into Japan is normally distributed to the end-user through one of four channels: Direct sales by manufacturers, sales agents, direct sales organizations, or joint venture companies. Distribution through sales agents is by far the most common method, accounting for about 76% of the country's total machine tool imports. Direct sales by manufacturers, particularly by U.S. producers, account for an additional 20% of the import sales. The remaining 4% is shared equally by direct sales organizations and joint ventures. At present, eight direct sales organizations, which are subsidiaries or branch offices of foreign manufacturers, are operating in Japan and their number is expected to increase in the near future.

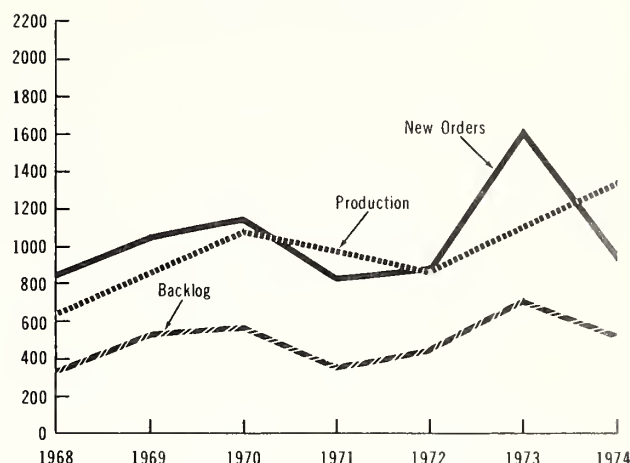
Imported machine tools may be installed either by the foreign manufacturer, the import agent, or the end-user. Complex equipment is frequently installed by the foreign manufacturer. The normal warranty for both domestically produced and imported machinery is one year.

Imported metalworking and finishing equipment is serviced primarily by the sales agents. These agents are usually not prepared to service numerically controlled systems, and trade sources recommend that suppliers train their representatives to provide competent service.

Although leasing of metalworking and finishing equipment is a relatively recent practice in Japan,

Figure 2. — Japan: Machine tool production, new orders, and value of backlog held by local manufacturers, 1968-74

(in millions of U.S. dollars)



Source: U.S. Department of Commerce, Bureau of International Commerce, market research study. Values based on Japanese trade source estimates.

accounting for only 1.1% of the machinery distributed in 1970, the concept is gaining in popularity and leasing is likely to increase in the near future.

Japanese tariffs on metalworking and finishing equipment imported from the United States range from 5.2% on drilling machines to 10.8% on certain types of metal forming machines. Japan's Customs Tariffs Law, however, exempts from duty industrial equipment that is not available from domestic manufacturers and is used in the production process. To date, the duty rates have had a negligible effect on imports of U.S.-made MFE, as most of the equipment imported is not produced domestically.

Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4217, Main Commerce Building, Washington, D.C. 20230.

Technical Requirements

The characteristics of Japan's electrical supply are 100 volts, 50 hertz, in Northern Japan (including Tokyo), and 100 volts, 60 hertz, in other regions. Installations of 200, 3,000 and 6,000 volts are also available. There is a trend toward the installation of more 6,000-volt lines for industrial and other major customers.

Japan uses the metric systems of weights and measures exclusively.

There are no compulsory technical or legal requirements governing the quality of metalworking and finishing equipment purchased. Japan Industrial Standards (J.I.S.) have been developed by the Industrial Science and Technology Agency of the Ministry of International Trade and Industry for domestically produced parts and accessories and are applied voluntarily. The J.I.S. are often based on U.S. standards. Equipment built to U.S. standards is therefore acceptable throughout Japan. Additional information on Japanese technical standards

may be obtained from the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230:

"The Market for Metalworking and Finishing Equipment in Japan", DIB 74-06-514, March 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Japan. The table gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by Japan in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Japan: Imports of metalworking and finishing equipment 1968-78, alternate years

Type of Equipment	(in millions of U.S. dollars)					
	1968	1970	1972	1974	1976	1978
<i>Metal Cutting:</i>						
Lathes.....	19.9	17.2	11.5	13.5	15.3	18.6
Lathes, numerically controlled.....	---	.9	3.7	5.6	7.1	9.0
Drilling machines.....	4.2	5.2	2.7	3.2	4.2	5.8
Drilling machines, numerically controlled.....	---	1.2	.3	.5	.7	1.1
Boring machines.....	7.4	10.8	4.7	5.8	7.3	10.0
Boring machines, numerically controlled.....	---	3.9	.3	.7	2.6	3.7
Milling machines.....	9.5	14.1	6.4	7.4	8.1	9.0
Milling machines, numerically controlled.....	---	4.0	3.2	4.9	7.7	9.7
Planers.....	.7	1.2	.4	.4	.8	.9
Grinding machines.....	17.2	28.2	15.0	17.1	22.4	26.9
Grinding machines, numerically controlled.....	---	---	.9	1.3	1.9	2.7
Gear cutting machines.....	25.5	21.4	16.6	20.7	24.7	28.0
Other metal cutting machines.....	10.4	14.4	6.5	8.1	14.1	22.4
Other metal cutting machines, numerically controlled.....	---	.1	.4	.7	.9	1.4
Total.....	94.8	122.6	72.6	89.9	117.8	149.2
<i>Metal Forming:</i>						
Bending machines.....	1.5	1.2	1.0	1.2	1.4	1.7
Hydraulic press.....	2.4	2.1	2.2	2.4	2.9	2.9
Mechanical press.....	13.6	7.2	3.9	4.5	5.1	4.9
Mechanical presses, numerically controlled.....	---	.3	---	.2	.1	.3
Other press machines.....	.3	.1	.2	.2	.3	.2
Shearing machines.....	2.0	2.4	1.3	1.7	2.1	2.2
Shearing machines, numerically controlled.....	---	---	.1	.1	.2	.4
Forging machines.....	8.6	7.5	10.7	13.7	15.1	21.4
Other metal forming machines.....	9.8	15.3	8.7	10.3	15.6	20.2
Total.....	38.2	36.1	28.1	34.3	42.8	54.2
<i>Other Metalworking Equipment:</i>						
Metal casting machines.....	.9	1.3	1.9	2.3	2.5	3.2
Total.....	.9	1.3	1.9	2.3	2.5	3.2
<i>Parts, Accessories, Tools and Dies:</i>						
Tool holders.....	.2	.8	.6	.6	.7	1.0
Parts and accessories for machine tools.....	5.5	10.8	8.2	10.0	11.3	14.5
Parts of metal casting machines.....	.2	.1	.1	.1	.3	.3
Metal cutting tools.....	2.5	7.3	6.7	6.9	7.9	10.1
Hard metal tools.....	.2	.2	.1	.2	.2	.2
Diamond tools.....	.2	.4	.5	.5	.6	.8
Total.....	8.8	19.6	16.1	18.3	21.0	26.7
<i>Metal Finishing:</i>						
Grinding and mill stones.....	.5	.9	.9	1.2	1.6	2.0
Cutting wheels.....	.2	.4	.3	.4	.6	.7
Abrasive paper and cloth.....	1.0	1.4	2.0	2.5	3.5	4.4
Spray guns.....	.5	.8	1.9	3.1	4.2	5.2
Electric grinders.....	.1	.2	.1	.1	.2	.3
Brushes for metal parts.....	.1	.2	.2	.3	.4	.5
Other.....	---	---	.7	---	---	.2
Total.....	2.4	3.9	6.1	7.6	10.5	13.1
Total metalworking and finishing equipment.....	145.1	183.5	124.8	152.4	194.6	246.6

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Japanese official trade statistics and trade source estimates.

Korea

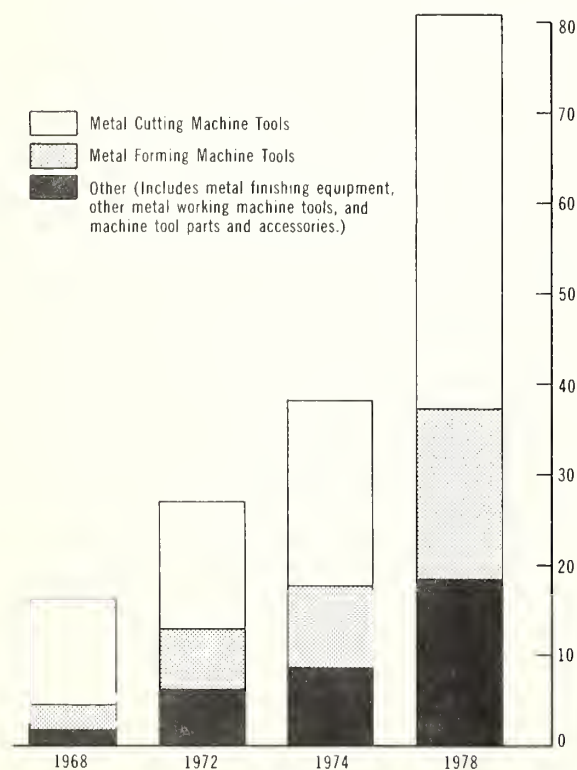
A rapid pace of development which began a decade ago is moving Korea into the ranks of industrialized nations. As new plans to broaden the country's industrial base are implemented, the market for metalworking and finishing equipment (MFE) should prove particularly active. In 1973, Korea adopted an ambitious 8-year, Heavy Industry and Chemical Development Program. Incentives favoring the development and modernization of such industries as shipbuilding, iron and steel, automotive manufacture, and industrial machinery—all

utilizing large quantities of machine tools—are expected to push the country's economic growth to a 9 to 11% average annual rate in real terms over the life of the plan. Major long-term goals are (1) a vastly expanded export capability and (2) reduced dependence on imports. However, Korea anticipates importing most of its capital equipment in the initial stages of the program and is likely to continue to purchase technologically advanced and high-precision machinery from abroad for the foreseeable future.

Korea has experienced considerable economic growth during the last decade due to the expansion of light industry and exports. Korea's gross national product (GNP) increased at a real average annual rate of 10.3% between 1968 and 1972 and rose by a record 16.9% in 1973 to reach \$11.4 billion. The value of industrial production rose to approximately \$7.1 billion in 1973. Although few of the larger planned industries can start production before 1978, the modernization and expansion of existing enterprises should provide the foundation for a substantial growth of the economy through 1978.

Korea's rising requirements for metalworking and finishing equipment correlate closely with its rapid industrial development. Between 1972 and 1974, for example, total consumption is estimated to have grown by nearly 70%, going from \$16.1 million to \$33.7 million. Trade sources speculate that the 1978 level could exceed \$80 million, representing an average annual rate of growth of approximately 21%¹ over the 4-year period (see table 1). As in the past, imports will account for

Figure 1. KOREA: Consumption of Metalworking and Finishing Equipment, 1968, 1972, 1974 and 1978
(In millions of U.S. Dollars)



SOURCE: U.S. Department of Commerce, Bureau of International Commerce market research survey. Values based on official statistics and trade source estimates.

¹ The above figure and subsequently cited growth rates are based on U.S. dollar values.

The following exchange rates have been used in converting local currency to U.S. dollars:

Year	Won/U.S. \$1.00
1968	282
1970	323
1972	399
1974-78	400

almost all new metalworking equipment and machine tool purchases.

The reasons for the projected increase are two-fold: (1) many new industrial plants will probably purchase advanced capital equipment for startup; and (2) established enterprises will likely take advantage of financial incentives offered by the government to retool.

Although 1972 data indicated that more than 80% of all machine tools in use in Korea were less than 10 years old, nearly 60% represented relatively low-precision equipment that will need replacement if development goals are to be met. New orders for machine tools, estimated at \$17.4 million for 1974, are expected to rise sharply between 1974 and 1978 as the industrial sector upgrades and diversifies production.

Consumption of metal cutting machine tools in Korea is expected to expand from \$14.3 million in 1972 to nearly \$20.5 million in 1974, an average

annual increase, of 20%. A similarly high growth rate is projected for the 1974-78 period, with the market in the latter year reaching approximately \$43 million. A shift in demand favoring more advanced and specialized tools should account for much of the increase. Currently, only a limited range of general cutting tools (such as lathes) is produced domestically.

Korea's requirements for metal forming machine tools also are expected to rise rapidly. New purchases of heavy presses for use in the production of industrial machinery and equipment, as well as equipment for the iron and steel fabrication industry, will contribute to this rise. Projections indicate a probable 1978 market totaling in excess of \$19 million, representing a 20% average yearly gain over the \$9.1 million estimated for 1974. Growth between 1972 and 1974 averaged slightly over 17% annually. Simple metal presses, produced chiefly for export, are the major metal forming equipment items manufactured in Korea.

The Korean market for metalworking and finishing equipment has been and should remain about 90% dependent on imports through 1978. Although the domestic machine tool manufacturers produce a wide range of basic equipment and export some items to developing countries, they cannot presently supply either the volume of standard equipment or the kinds of advanced and specialized equipment now in heavy demand in Korea. As the country's

Table 1.—Korea: Consumption¹ of metalworking and finishing equipment, 1968-78
(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Other metal- working machine tools	Machine tool parts and accessories ²	Metal finishing equipment	Total
1968						
Production	1.78	.96	—	.59	—	3.33
Imports	9.89	1.88	.99	—	.07	12.83
Exports .....	.01	—	.03	—	—	.04
Consumption	11.66	2.84	.96	n.a.	.07	16.12
1972						
Production	1.23	2.92	1.94	1.78	—	7.87
Imports	13.31	6.16	2.58	—	.06	22.11
Exports .....	.27	2.47	.14	—	—	2.88
Consumption	14.27	6.61	4.38	n.a.	.06	27.10
1974						
Production	1.70	4.03	2.67	2.46	—	10.86
Imports	19.19	8.48	3.56	—	.08	31.32
Exports .....	.38	3.41	.19	—	—	3.98
Consumption	20.51	9.10	6.04	n.a.	.08	38.20
1978						
Production	3.44	8.22	5.73	5.27	—	22.66
Imports	40.88	18.10	7.64	—	.16	66.78
Exports .....	.81	7.30	.40	—	—	8.51
Consumption	43.51	19.02	12.97	n.a.	.16	80.93

¹ Consumption equals production plus imports minus exports.

² Imports and exports included under metal cutting and metal finishing machine tools.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Korean trade statistics and trade source estimates.

industrialization program progresses, increasing amounts of certain equipment that can only be procured abroad will be needed. Therefore, the backlogs of domestic manufacturers, which remain fairly constant at about 10% of total production, will continue to have minimal effect on the purchasing decisions of the larger and more progressive end-users.

Imports of MFE in 1972 totaled \$22.1 million, more than 60% of which was purchased from Japan. The United States and Germany were also major suppliers, with market shares of 10% and 5%, respectively. Trade sources expect 1976 imports to amount to more than \$45 million, an increase of more than 100% above the 1972 level (see Appendix). Projections indicate that the U.S. share could increase to as much as 22% in 1976 if U.S. suppliers maximize their sales efforts and the Government of Korea continues to encourage its businessmen to diversify their sources of import supply. Even under such circumstances, however, Japan is likely to retain a large share of the market because of geographical proximity, "tied-procurement" policies common to Korean-Japanese joint-venture businesses, and availability to Korean enterprises of property claim funds that can be used only for purchases in Japan.

Continuance of the trend toward use of improved equipment by Korean end-users could result in increased U.S. sales of metal cutting machine tools. The United States in 1972 supplied \$1.2 million, or 12%, of such imports (see table 2).

Metal forming machine tools also offer excellent sales potential for U.S. suppliers. Anticipated purchases of presses, forging machines, drawing machines, and other forming machinery could boost the U.S. share of this market from the 10% recorded in 1972.

Sales Opportunities

Markets in all categories of metalworking and finishing equipment should expand as Korea develops new heavy industries and encourages established industries to upgrade product quality standards.

To accommodate an anticipated increase of 17.6% annually in demand for rolled steel products, extensive plant modernization and the installation of new capacity will be required of the Korean iron and steel industry. Thus, imports of metalworking machinery auxiliary to rolling mills in the fabrication of iron and steel products will increase. Imports of metal sawing and cutoff machines are projected to more than double between 1972 and 1978, rising from \$190,000 to over \$550,000, while imports of punching and shearing machines should grow from \$1.4 million to over \$4 million during the same period. Purchases of forging machines from foreign

Korea—Age of Metalworking and Finishing Equipment Currently in Use

Age of equipment	Percent
less than 5 years old	51
6 to 10 years old	31
11 to 15 years old	9
over 15 years old	9
Total	100

Source: U.S. Department of Commerce, Bureau of International Commerce, market research study.

suppliers are projected to nearly triple, climbing from \$621,000 in 1972 to over \$1.8 million in 1978. Sales of drawing machines are projected to increase by nearly 200%, going from \$256,000 in 1972 to over \$750,000 in 1978.

A market research study recently conducted in Korea for the U.S. Department of Commerce, Office of International Marketing, has identified the following additional classes of equipment as having particularly favorable prospects for U.S. exporters. All are basic equipment items, 98% supplied by imports. In view of these factors, an approximate threefold increase in the import level of each has been projected for the 1972-78 period.

Presses, 5 metric tons and above.—Heavy presses should make up the largest single category of metalworking equipment imports over the next 4 years as the Korean machinery manufacturing industry retools and expands. Purchases of foreign heavy presses should increase from \$4.8 million to \$14.3 million over the 1972-78 period. Although small companies have previously been responsible for most of Korea's machinery production, the industry has recently become a major beneficiary of Government development incentives aimed at self-sufficiency in machine production.

In the past, the industry has tended to purchase Japanese machinery, and in 1972 Japan supplied about 35% of the presses imported in the over 5 metric tons category. Korean manufacturers, however, generally acknowledge the superiority of U.S.-manufactured equipment and, with low-cost equipment financing available under the Government's development plan, these firms can shift their purchasing patterns. U.S. firms will therefore have greater access to the market and should be able to expand their sales substantially above the 10% recorded in 1972.

Some U.S. manufacturers recently active in the Korean market includes: Ajax Manufacturing Company (forging presses); Chambersburg Engineering Company (car wheel presses); Danly Machine Specialties, Inc. (mechanical and power presses); Hydraulic Press Manufacturing Company (hydraulic

Table 2.—Korea: Imports of metalworking and finishing equipment from selected countries, 1972¹
(in thousands of U.S. dollars)

Equipment	U.S.	Germany	U.K.	Japan	Italy	Other	Total Imports
Metal cutting machine tools	1,233.1	911.3	152.5	9,239.6	9.0	1,761.7	13,307.2
Metal forming machine tools	635.7	30.0	2.4	2,790.0	—	2,694.9	6,153.0
Other metal-working machine tools	351.5	164.5	107.6	1,557.7	—	404.5	2,585.8
Metal finishing equipment	—	—	—	55.8	—	—	55.8
Total	2,220.3	1,105.8	262.5	13,643.1	9.0	4,861.1	22,101.8

¹ Includes parts and accessories.
Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Korean trade statistics.

presses); and Johnson Mfg. Corp., Division of South Bend Lathe (power presses).

The following types of presses should offer the best sales prospects over the 1974-78 period.

- Automatic high-speed presses
- Vertical double-action presses
- Horizontal presses
- Horning presses
- Multiple transfer automatic presses

Grinding machines.—Increased demand for grinding machines is predicted to raise imports of this machinery from \$2.6 million to \$7.8 million between 1972 and 1978. The United States, which supplied about 11% of the imports in the earlier year, should be able to increase its share of the market over the 4-year-period. At the same time, some erosion may be expected in the position of Japan, which in 1972 supplied about three-fourths of the grinding machines imported by Korea.

U.S. manufacturers that have been selling grinding machinery to Korea include the Bryant Chucking Grinder Division of Ex-Cell-O Corporation (internal grinding machines); Gardner Machine Company (surface grinding machines and vertical and horizontal spindle grinders); Landis Tool Company (universal and crankshaft grinding machines); Moore Special Tool Company (jig grinders); Norton International, Inc. (universal, centerless, and horizontal grinders); O.K. Tool Company (universal tool and cutter grinders); and Setco, Inc. (bench and pedestal grinders).

Korean trade sources expect the following kinds of grinding equipment to be highly salable over the next 4 years:

- External centerless grinding machines
- External universal grinding machines
- Internal chucking grinding machines
- Roll grinding machines
- Floor-stand (pedestal) grinding machines
- Jig grinding machines
- Rotary table grinding machines
- Broach grinding machines

- Universal tool and cutter grinding machines
- Special purpose grinding machines

Milling machines.—Imports of milling machines should rise from \$2.02 million to approximately \$8 million over the 1972-78 period as Korean end-users replace obsolete equipment and upgrade their production. Trade sources anticipate that purchases will favor high-efficiency, precision milling machines to a much greater degree than in the past. This factor, along with the reputation of U.S. milling machinery for durability, should enable American exporters to increase their share of the market. Data for 1972 indicate that imports from the United States in that year amounted to \$281,400, or about 14% of the total. Japan, with almost 50% of the market, was the major source of supply in the same year, and Germany recorded sales about equal to those of the United States.

American milling machines sold to Korea in the recent past include turret milling machines, among these being tracer controlled turret millers, manufactured by Bridgeport Machines, Inc.; bed type milling machines, produced by Cincinnati Gilbert Machine Tool Co.; handymills, from the G. A. Gray Co.; and universal, planer, and vertical milling machines, from Kempsmith Machine Co.

Milling machines most likely to be in heavy demand through 1978 include the following:

- Bed-type milling machines
- Crankshaft milling machines
- Duplicating milling machines
- Horizontal knee and column milling machines
- Planer milling machines
- Tracer controlled milling machines
- Turret-type milling machines

Drilling machines.—The Korean market for imported drilling machines amounted to \$1.56 million in 1972 and is expected to exceed \$4.5 million in 1978. Sales by U.S. firms totaled \$29,900 in 1972. Japan was the leading supplier with exports of about \$1.4 million, followed by Germany with sales of \$42,900. A decline in the Japanese position,

coupled with increased competition from Germany and other foreign suppliers, is predicted through 1978.

Drilling machinery recently sold in Korea by U.S. firms included way type and radial drilling machines from the Cincinnati Gilbert Machine Tool Co.; multiple spindle and radial drilling machines from the I. O. Johanson Company; special drilling machines and gun drilling machines from Leland Gifford Company; and DEKA multispindle drills from South Bend Lathe.

The following types of drilling machinery should offer particularly good sales opportunities to U.S. suppliers:

- Deep hole drilling machines
- Drilling and tapping machines
- Bench-type sensitive drilling machines
- Turret head drilling machines
- Way type and unit head drilling machines

Other sales opportunities.—Other equipment items expected to show extensive import growth through 1978 include perishable cutting tools for machine tools; lathes; punching and shearing machines; planing, shaping, slotting, and broaching machines; transfer machines; and polishing, lapping, honing, and finishing machines. U.S. sales of forging machinery and planers in 1972 accounted for 18.9 and 29.7%, respectively, of imports of those equipment items. Sales of drilling and tapping machines, engine lathes, and automatic lathes also exceeded the general average of 12.8% accorded for U.S.-made products.

Among the leading Japanese firms competing with U.S. metalworking equipment manufacturers for sales in Korea are Dainichi Kinzoku Kogyo Co.,

Ltd.; Fujikoshi Co., Ltd.; Ikegai Iron Works, Ltd.; Iwashita Industrial Co., Ltd.; Okuma Machinery Works, Ltd.; Sizuoka Machine Tool Co., Ltd.; Toyoda Machine Works, Ltd.; and Toshiba Machine Co., Ltd. These manufacturers and such German firms as Theil, Maho, Waldrich Siegen, and Bohle sell a wide range of machine tools and related items.

The outlook for sales of numerically controlled (NC) machine tools, digital readouts and similar advanced equipment in Korea is brightening, with limited initial sales probable during the 1974-78 period. A number of Korean metalworking firms are technologically capable of using NC equipment, but the advantages of such machines are little known in the market and none has yet been installed. Trade sources believe that careful sales development could lead to purchases of up to \$11 million by 1976.

End-User Industries

The rapid expansion of the Korean manufacturing sector which began during the early 1960's included the establishment of a number of new industries, notably the motor vehicle, electronics, electrical appliance, and communications equipment industries. By 1971, Korea had about 2,300 manufacturing enterprises in 21 industries that used significant amounts of metalworking and finishing equipment.

The 15 largest end-user industries of metalworking and finishing equipment reported capital investment of \$84.4 million and sales of \$728.8 million in 1971, both nearly triple the 1966 levels (see table 3). Concurrent with this expansion, the industries' composition is shifting toward larger, bet-

Table 3.—Korea: End-users of metalworking and finishing equipment, by industry, 1971
(in millions of U.S. dollars)

Industry	No. of manufacturers	Value of sales	Value of capital investment	No. of workers
1. Iron and steel products	321	255.4	43.7	25,872
2. Electrical machinery and parts	432	182.4	3.2	42,172
3. Motor vehicles and parts	438	152.1	11.2	23,462
4. Boilers, pumps, engines, and other industrial equipment	303	24.1	.6	7,835
5. Boats and ships	299	22.7	11.9	7,508
6. Copper and copper products	29	20.4	1.4	1,286
7. Railway equipment	15	19.6	10.2	4,162
8. Tin and tin products	24	10.5	.1	1,936
9. Musical instruments, tape and record players	38	8.8	.8	3,639
10. Watches, clocks, and parts	35	8.2	.7	2,364
11. Tools, cutlery, etc.	70	6.9	.1	4,954
12. Magnesium, beryllium, and products thereof	16	5.3	.2	620
13. Aluminum and aluminum products	92	5.1	.1	2,569
14. Zinc and zinc products	13	3.8	.1	1,321
15. Lead and lead products	19	3.5	.1	1,027

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Korean statistics.

ter-capitalized firms and a higher level of technological input. While the number of firms had increased by only 19% and the number of employees by only 39% during the 1966-71 span, value added had risen by nearly 250% to approximately \$260 million.

Korea's plan for the development of heavy and chemical industries, adopted in 1973, gives high priority to the development of six industries—iron and steel, chemicals, nonferrous metals, machinery, shipbuilding, and electronics. Special incentives provided by the Government assist these major machine tool end-users. The Government is establishing six specialized industrial zones to house the respective industries and is providing funds for low-cost construction and equipment loans to enterprises in the designated groups. The development plan calls for total investment of \$14 billion over its 8-year span. This figure includes anticipated private sector and foreign capital, as well as direct government inputs. New industries will have a 3-year tax holiday and reduced taxes for a subsequent period. In addition, the country's tariff policy provides protection to all domestic industries against foreign competition.

The 10 industry sectors which constitute the principal end-users of metalworking and finishing equipment in Korea accounted for combined product shipments of \$494.3 million in 1971; that same year, these sectors accounted for combined capital expenditures of \$388 million. Together these figures represent about two-thirds of the product shipments and expenditures reported by all end-users in that year (see table 4). Most of the sectors listed have expanded rapidly in recent years, and they should continue to expand under the government's new development plan. The predicted value of combined shipments in 1978 is \$997 million, indicating aver-

age growth of approximately 13% annually over the \$615 million estimated for 1974.

Capital expenditures of the 10 sectors are expected to rise steadily from \$481 million in 1974 to about \$640 million in 1978 (see table 5). This projection anticipates that expenditures will continue to increase by 7.4% per year, the same rate that applied during the high-growth period of 1970-74.

Five of Korea's manufacturing sectors using the most metalworking equipment are discussed in the sections following:

Major Korean prospective buyers for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications and trade associations.

Rolling of purchased iron and steel.—Korea's 60 plants in this sector produced 138,000 metric tons of rolled iron and steel products in 1971. The sector's shipments were valued at \$166.1 million and capital expenditures at \$143.5 million. Most of the firms engaged in producing rolled iron and steel are small, specialized enterprises, rather than integrated rolling mills, and their equipment is largely outdated. Nevertheless, the sector had developed

Table 4.—Korea: Principal end-users of metalworking and finishing equipment, by industry sector, 1971
(in millions of U.S. dollars)

Sector	No. of plants	Product shipments	Capital expenditures
1. Rolling of purchased iron and steel	60	166.1	143.5
2. Motor vehicles	15	114.1	81.9
3. Radio and TV receiving sets	47	52.6	39.6
4. Parts of motor vehicles	219	30.9	21.1
5. Communications apparatus and equipment, telephones	55	28.8	19.6
6. Smelting and refining nonferrous metal	17	21.1	19.5
7. Railroad equipment	15	19.6	17.8
8. Shipbuilding and repair	299	22.7	16.8
9. Iron and steel molding and casting	140	21.2	15.0
10. Iron and steel	160	17.2	13.2
Subtotal, 10 largest sectors	1,027	494.3	388.0
Subtotal, all other sectors	2,976	270.2	204.7
Total, all end-user sectors	4,003	764.5	592.7

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Korean trade statistics and trade source estimates.

Table 5.—Korea: Capital expenditures of principal end-users of metalworking and finishing equipment, by industry sector, 1970, 1974 and 1978
(in millions of dollars)

Sector	1970	1974 ¹	1978 ¹
1. Rolling of purchased iron and steel	135	180	239
2. Motor vehicles	87	102	136
3. Radio and TV receiving sets	25	49	66
4. Parts of motor vehicles	18	25	33
5. Communications apparatus and equipment, telephones	17	24	32
6. Smelting and refining nonferrous metal	22	24	32
7. Railroad equipment ..	21	22	29
8. Shipbuilding and repair	17	21	27
9. Iron and steel molding and casting	13	18	25
10. Iron and steel	8	16	21
Total	363	481	640

¹ Estimate.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Korean statistics.

sufficient capacity to match a 25.9% average annual increase in domestic demand over the 1962-71 period and to establish significant export markets. Shipments attained an estimated value of \$208 million in 1974, representing average annual growth of 13.7% over the 1970 level of \$154 million. In the same 4-year period, estimated capital expenditure increased from \$135 million to \$180 million, representing a 13.3% annual increment. By 1974, Korea ranked eighth in the list of world exporters of rolled steel products.

Domestic manufacture includes shaped steel, bar steel, reinforcing bars and rods, and sheet steel. Imports continue to supply rails and large-size shaped steel, but plans also call for local production of these items.

The government's plan for the development of heavy and chemical industries emphasizes the expansion and modernization of plants manufacturing rolled iron and steel products. The sector is expected to achieve export targets of 1.12 million metric tons in 1975 and 3.8 million metric tons in 1981, in addition to satisfying anticipated growth in domestic demand. Projections for 1978 indicate increases in shipments to \$304 million and in capital expenditures to \$239 million.

To help achieve the production target, a program to expand the capacity of the country's only integrated steel works, the Pohang Composite Steel

Mill, has already begun. The mill will have a capacity of 7 million metric tons per year when completed. A second large mill with a 5-million metric ton capacity is in the planning stage, with construction scheduled to begin in 1976. Other specialized mills for the supply of machine manufacturers are to be established in the new industrial machinery complex at Changwon. Existing manufacturers may also modernize and expand under incentives provided through the development plan.

Trade sources anticipate heavy demand for forging machines, cutting machines, drawing machines, and special steel cutting tools.

Motor vehicles and parts.—Korean automotive production is confined at present to assembly operations using predominantly imported components, and the manufacture of a limited number of automotive parts. Four companies assemble motor vehicles in Korea under agreement with major foreign manufacturers: Shinjin Motor Company (General Motors); Hyundai Motor Company (Ford); Asia Motors Company, Ltd. (Fiat); and Kia Industrial Company (Honda and Toyo). The production of motor vehicles in Korea was begun in 1962; by 1971 the sector comprised 15 plants, had product shipments of \$114.1 million, and made capital expenditures of \$81.9 million. In 1972 the automotive sector produced 9,525 passenger cars in 7 models; 2,581 buses in 9 models; and 6,542 trucks in 10 models, including a line of three-wheeled trucks assembled by Kia.

More than 200 factories are engaged in the manufacture of automotive parts; these firms reported shipments of \$30.9 million and capital expenditures of \$21.1 million in 1971. Trends indicate an increase in both the level of products shipped and of capital expenditures over the 1970-74 period, with 1974 shipments estimated at \$38 million and expenditures at \$25 million. The products manufactured include cylinder linings, timing gears, metal bearings, valves, change levers, universal joints, axle shafts, leaf springs, brake linings, heaters, gaskets, piston pins, and piston rings.

Trade sources predict a 30 to 40% growth in both the assembly and manufacture of parts over the 1974-78 period. Shipments of motor vehicles are projected to rise from a value of \$143 million to \$190 million over the 4-year span, while shipments of parts should increase from \$38 million to \$51 million. Parallel increases in capital expenditures are expected to result in a 1978 level of \$136 million for motor vehicles and \$33 million for parts.

The development program of the Korean Government seeks a substantial increase in the proportion of locally produced components used to assemble automobiles in Korea. Although domestic parts in 1973 accounted for 50 to 60% of those used in assembling vehicles, important parts such as en-

gines, transmissions, and bodies were imported. Construction of facilities to manufacture some of these parts in Korea, however, is now underway. Among the new projects are a gasoline engine plant by General Motors, Korea; a diesel engine plant by the Korea Machine Industrial Company Ltd.; and a second diesel engine plant by the Kia Industrial Company. The Hyundai Gear Industrial Company, Ltd. is preparing to build a transmission plant, and a body-press factory is expected to become operational in 1974.

The specific types of equipment that should have good sales potential in this sector between 1974 and 1978 include—

- Engine lathes
- Automatic lathes
- Drilling machines
- Turret type drilling, milling, and turning machines
- Planing machines
- Gear cutting machines
- Grinding machines
- Presses
- Boring machines
- Transfer machines

The level of technology used by the sector in the manufacture of metal parts varies considerably according to the size and sophistication of the manufacturer. Some Korean products such as pistons, piston rings, and cylinder linings meet international competitive standards and are widely sold in export markets. However, Korean automotive parts generally are not considered comparable to foreign products in endurance, precision, and efficiency.

Industrial machinery manufacturing.—Korea's industrial machine manufacturing sector is a primary target of the government's development plan, which has as an objective the establishment of export trade in industrial machines as well as domestic self-sufficiency. Although the machine sector has recorded average annual growth of about 27% in recent years, it remains composed largely of small shops using basic equipment and a high labor input. The typical industrial machine shop produces a limited range of specific machinery items for a specific industry and is consequently highly vulnerable to the business fluctuations of its end-user. Thus the country has been heavily dependent on imports for industrial machinery, and this import-dependence has increased as certain end-user industry production (e.g., electronics) has been upgraded for sale in export markets.

Korean industrial machinery production is now confined to a limited range of simple, nonprecision equipment, usually less durable than foreign-made counterparts. In all, local manufacture accounts for only about 45 to 50 types of industrial machinery in 6 main categories. These are casting and moulding machines (e.g., speedy milling machines, jolt squeeze moulding and shot tumblasts ma-

chines), compressors, blowers, pumps, and other pneumatic hydraulic machinery (e.g., pneumatic conveyors and air compressors), chemical machinery and equipment (e.g., dryers, separators, and centrifuges), construction and mining machinery (e.g., concrete mixers and cutters), plastic molding and processing machinery (e.g., injection molding and extruding machines), and textile machinery (e.g., industrial and domestic sewing machines and high-speed spool winders). Most of the major metal parts used are imported.

The development program projects the establishment of 29 new industrial machinery plants within an integrated machinery complex now under construction at Changwon, Kyungsang Namdo, as well as the modernization and expansion of existing facilities throughout the country. The plan calls for the new plants to produce equipment to be used for textiles, agriculture, construction and mining, chemical industries, sewing, woodworking, wrapping, plastics processing, food processing, printing and bookbinding, lifting and hauling machinery, prime movers, anemo-hydraulic power machines, metalworking machine tools and metal processing machinery, refrigerating equipment, and casting machines. Other major objectives within the industry are the attainment of a high degree of specialization and improvement in the level of technology.

Because of the extensive development underway, the metalworking equipment items expected to have the best market in this sector over the next 4 years are as follows:

- Double-end and facing boring machines
- Horizontal boring-drilling-milling machines
- Double-column vertical boring machines
- Center-column drilling machines
- Turret-head drilling machines

Such purchases will probably be heaviest in 1977 and 1978, when some of the new Changwon plants become operational.

Shipbuilding.—The shipbuilding industry in Korea in 1972 had a total capacity of 190,000 tons; the goal for 1980 is set at 5 millions tons. The country's government is now engaged in a large-scale investment plan to encourage promotion of this sector of the economy. If this plan is successful, Korea's shipbuilding industry will rank among the top 10 in the world.

The shipbuilding and repair sector in 1971 consisted of 299 plants, with shipments of \$22.7 million and capital expenditures of \$16.8 million. Total annual shipments are projected to be \$37 million by 1978, and capital expenditures should reach \$27 million that same year.

Of the 140 shipbuilding enterprises reported active in Korea in 1972, most are small-scale firms engaged in building wooden and small-size vessels. Three shipyards with the capacity to construct ships

of more than 1,000 tons are the Korea Shipbuilding and Engineering Co., Ltd.; the Hyundai Shipbuilding and Heavy Enterprises Co., Ltd.; and the Taeson Shipbuilding Company. Hyundai has recently constructed a new shipyard with an annual building capacity of 700,000 tons in Ulsan, Kyongsang Pukto. The Korea Shipbuilding and Engineering Company plans to construct a new shipyard at Okpo, Koje, with a capacity of 1 millions tons a year. In addition, the government has plans to build 15 plants for manufacturing machines for ships, investing \$61 million by 1981. Several other groups in Korea are also interested in shipbuilding ventures, either with the government or with foreign sources. The largest of the proposed facilities is a \$150-million shipyard to construct vessels in the 1-million-ton class; this is to be a joint venture of Korea's Samsung group and Ishikawajima Harima of Japan.

Domestic Manufacture of Metalworking and Finishing Equipment

Korea's metalworking and finishing equipment industry expanded production since its inception in 1963 to \$8.21 million in 1972. A further increase to about \$23 million in 1978 is projected. Domestic manufacturers of MFE supply only about 10% of total consumption. In view of the government's continuing heavy emphasis on exports and the increasingly sophisticated requirements of domestic end-users, little increase in the market share of local firms is anticipated through 1978.

Approximately 160 Korean firms manufactured machine tools and metalworking machinery in 1972. They produced some 30 types of inexpensive, general-purpose equipment such as sawing machines, milling machines, lathes, slotting machines, hoppers, planers, shapers, shears, and punch presses. None of the manufacturers was utilizing high-efficiency or high-precision capital equipment. Although exports were extensive in 1972, amounting to \$2.9 million, they consisted of but a few major items sold primarily to developing countries. Presses were the largest export item, accounting for about 90% of total exports in the product category, while sales of automatic lathes (\$167,000) and metalworking tools (\$131,000) made up most of the remainder.

The pioneer among domestic machine tool manufacturers was a shipbuilding enterprise interested in product diversification, the Korea Shipbuilding and Engineering Co., Ltd. Another early manufacturer was a large general machinery works, the Korea Machine Industrial Company, Ltd. Others soon followed, and major producers now include the following firms: Chung Kong Sa; Hwa Chun Machinery Co., Ltd; Jeil Machinery Co., Ltd.; NamSun Machinery Company, Ltd.; Taegu Heavy Machinery Co., Ltd.; Inchun Machinery Co., Ltd.; Choong Ang Precision Machine Co., Ltd.; and Sam Chang

Machine Co., Ltd. Most manufacture a range of tools and machinery items.

No Korean manufacturers operate as subsidiaries of, or under license from, foreign manufacturers. In fact, the absence of foreign capital and technology has been a major factor limiting the development of the machine tool industry in Korea. To remedy this deficiency, the government has encouraged local manufacturers to enter into joint venture or technical cooperation agreements with foreign counterparts. Foreign investment in Korean industry is welcomed under a Foreign Capital Inducement Law which provides tax relief to approved enterprises.

Trade Regulations and Practices

Imports of most classes of metalworking and finishing equipment are dutiable, at rates of 10 to 20% ad valorem, but can range as high as 50% for accessories and parts. However, no duty is assessed on capital goods used for the manufacture of exports.

Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4127, Main Commerce Building, Washington, D.C. 20230.

Import licenses are required, but for the most part these are issued automatically for metalworking and finishing equipment if the applicant is an end-user. Agents and distributors may act only for principals; they may not import metalworking and finishing equipment for subsequent resale.

Only two sales agencies represent foreign suppliers in the Korean market: one for many major American and European manufacturers and the other for all Japanese suppliers. These agencies accept orders but seldom actively promote sales. British and German manufacturers deal directly with end-users, bypassing any agents in Korea. Japanese manufacturers cultivate the Korean market much more assiduously than other suppliers by paying frequent calls on end-users, placing regular advertisements in Korean publications and trade journals, and coordinating their sales activities through their mutual agent, the Hansa Trading Company, Ltd.

In Korea, the buyer customarily arranges the installation of equipment. In cases of specialized machinery or large quantities, however, special arrangements may be made for the exporter to provide training and assist with startup. Buyers expect warranties for product efficiency and replacement of parts. Service and maintenance contracts may vary considerably, but manufacturers of large machinery items frequently provide personnel to re-

pair breakdowns not covered under warranty, upon reimbursement for travel and per diem allowances.

Leasing of machinery is not well established in Korea, as only one company, the Korea Industry Leasing Corporation (established in 1972), is engaged in this practice. This firm maintains a very limited range of equipment, adding to its inventory through imports as specific items are requested.

Technical Requirements

U.S. standards for metalworking and finishing equipment are fully acceptable in Korea and are employed by Korean manufacturers. A National Industrial Standards Testing Laboratory (Kukrip Kongop Pyojun, Sihomso), located at 119 Tong-sun-dong, Chongno-ku, Seoul, Korea, tests the performance and efficiency of metalworking equipment manufactured in Korea and is empowered to develop standards, but no official national standards have been promulgated.

Electric power supply characteristics in Korea

are 60 hertz, 3-phase. Industrial users have power supplies available of 220, 3,300, 6,600, or 22,000 volts.

Korea employs the metric system of weights and measures, but the British system of weights and measures is widely understood within the metalworking industry.

Published national standards for metalworking and finishing equipment in Korea may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230:

"The Market for Metalworking and Finishing Equipment in Korea," DIB 74-09-505, January 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Korea. The table gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by Korea in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Korea: Imports of metalworking and finishing equipment, 1968-78 alternate years
(in millions of U.S. dollars)

Equipment	1968	1970	1972	1974	1976	1978
<i>Metal cutting equipment:</i>						
Slotting machines .....	.03	.09	.02	.03	.04	.07
Engine lathes .....	.54	.47	.48	.66	.97	1.17
Automatic lathes	3.78	1.26	.92	1.26	1.85	2.71
Turret lathes .....	.09	.06	.27	.37	.54	.78
Lathes, n.e.s. ....	.31	.55	.88	1.23	1.79	2.63
Planers .....	.18	.10	.34	.48	.70	1.02
Shaping machines .....	.16	.23	.21	.29	.42	.62
Drilling machines .....	.51	1.13	1.56	2.15	3.15	4.61
Boring machines .....	.59	.80	1.75	2.41	3.53	5.16
Milling machines .....	.59	1.41	2.02	3.61	5.29	7.75
Gear cutting or shaving machines .....	.19	.32	.32	.45	.65	.95
Filing machines .....	.02	—	.05	.06	.09	.14
Sawing machines .....	.10	.10	.19	.26	.38	.56
Grinding machines	2.41	1.54	2.65	3.65	5.35	7.83
Honing machines .....	.15	.03	.19	.26	.26	.56
Lapping machines .....	.02	.04	.04	.06	.09	.13
Shearing machines .....	.22	1.11	1.42	1.96	2.86	4.19
Total	9.89	9.24	13.31	19.19	28.09	40.88
<i>Metal forming equipment:</i>						
Bending machines .....	.09	.34	.25	.35	.51	.75
Presses .....	.34	.18	.18	.24	.32	.44
Presses over 5 metric tons	1.00	2.00	4.85	6.68	9.78	14.32
Forging machines .....	.16	.23	.62	.86	1.26	1.84
Drawing machines .....	.29	.19	.26	.35	.52	.75
Total	1.88	2.94	6.16	8.48	12.39	18.10
<i>Other metalworking machine tools:</i>						
Diesinking machines .....	.12	.17	.27	.37	.54	.79
Machine tools for working metallic carbides .....	.10	.57	.15	.21	.31	.45
Other metalworking machine tools .....	.33	.98	.39	.54	.79	1.16
Machine tools for working metals, n.e.s. ....	.44	1.52	1.77	2.44	3.58	5.24
Total .....	.99	3.24	2.58	3.56	5.22	7.64
<i>Metal finishing equipment</i> .....	.07	.01	.06	.08	.11	.16
Total	12.83	12.43	22.11	31.32	45.79	66.78

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Korean trade statistics and trade source estimates.

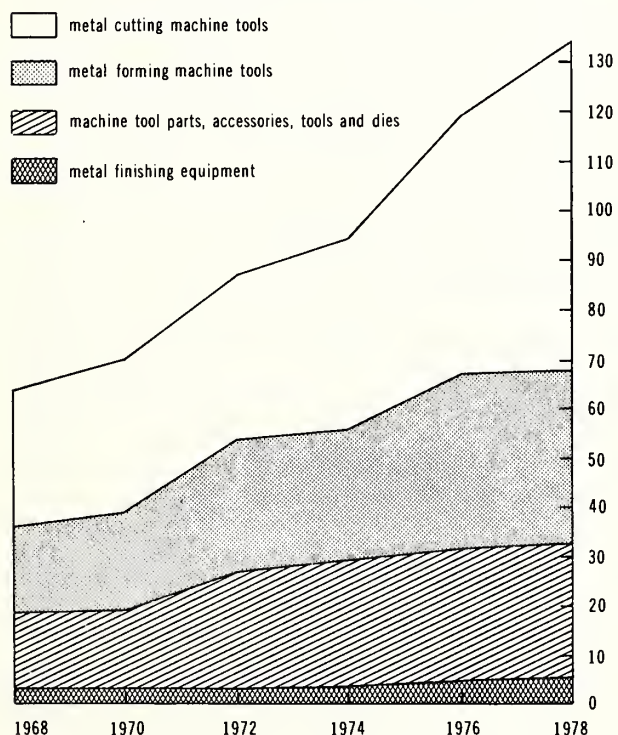
Mexico

Mexico's economic development continues at a steady and impressive pace, despite minor fluctuations. The country's gross domestic product (GDP) of \$42.1 billion in 1972 increased by about 7% in real terms in 1973. The government's 1973 imposition of monetary and credit restraints to combat inflation will slow this growth only marginally, and a further real rise in GDP of 6.5% is seen likely in 1974.

After a period of uncertainty following Mexico's 1970 presidential elections, business confidence is now on the upswing, with both public and private concerns calling for economic solidarity and a national effort to strengthen industry—largely through imports, at least for the next few years. The prevailing atmosphere provides an optimistic climate for accelerating investment projects. The 1972 capital investment level of \$7.4 billion is estimated to have gone up to \$11 billion in 1974 and is predicted to rise by 15% per year through 1978. Priority will be given to investments in the country's steel, fertilizer, and petrochemical industries, in addition to the transport and energy sectors, all heavy users of metalworking and finishing equipment (MFE).

Figure 1. — Mexico : Consumption^{1/} of metalworking and finishing equipment, 1968-78, alternate years

(in millions of U.S. dollars)



^{1/} excludes other metalworking equipment.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Mexican trade source estimates.

Mexico's increasingly complex industrial plant will require a broad range of metalworking machinery purchases throughout the remainder of this decade. After the relatively sluggish 1972-74 period, when machine tool consumption rose by only 4.5% a year from a base of \$89.2 million, purchases during the next 4 years are projected to increase by 9% annually (see table 1). The market should climb from \$97 million in 1974 to \$138 million in 1978. Notwithstanding the total consumption figures mentioned above, Mexico has a sizable import market for used metalworking machinery; this market amounted to \$26 million in 1972 and could reach \$44 million in 1978.

The age of the machine tools currently in use throughout Mexico is indicative of the country's vigorous efforts to modernize industry. Almost 60% of all the country's metalworking and finishing equipment has been purchased since 1964, a relatively high percentage in view of the fact that other sectors rely heavily on used equipment.

Industrial development in Mexico has largely been fueled by a massive influx of foreign-made

**Mexico—Age of metalworking and finishing
equipment currently in use**

Age of equipment	Percent
less than 5 years old	27
6 to 10 years old	33
11 to 15 years old	14
over 15 years old	26
Total	100

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

capital goods. The Mexican government, however, is striving to reduce the country's dependence on foreign suppliers and, through its import substitution program, is encouraging the local manufacture of metalworking equipment. During the next several years, domestic producers are expected to satisfy more of the country's requirements for conventional machine tools while foreign companies continue to supply Mexico's demand for more advanced items.

As a result of increased domestic output, imports will probably represent a declining but nonetheless substantial portion of the country's total machine tool consumption. Imports of metalworking and finishing equipment in 1972 amounted to \$79.1 million, or 88% of overall sales (see Appendix).

Purchases of foreign machinery will probably account for 86%, or \$84 million, of the 1974 MFE market and 80%, or \$110 million, of the projected 1978 consumption.

The country's urgent need for additional machine tools should stimulate the market for metal cutting equipment. This market is projected to expand by over 13.5% annually, rising from almost \$40 million in 1974 to approximately \$66 million in 1978. Purchases during the 1972-74 period climbed at the more moderate rate of nearly 11% per year, from a base of \$32.6 million. Imports are projected to almost double from \$27.9 million in 1972 to \$52 million in 1978. Domestic output should more than triple the 1972 level of \$5 million and approach \$16 million.

Consumption of metal forming machine tools in 1978 is anticipated to exceed \$35 million, up from \$28.3 million in 1972, when imports supplied 88% of the market. Although this proportion should drop to 78% in 1978, owing to the increasing competence of local manufacturers, imports should still reach a substantial \$28-million level in that year.

The modest Mexican market for metal finishing equipment—\$4.2 million in 1972—is almost entirely supplied by imports. Local production is likely to remain limited, and the near \$6-million market anticipated for 1978 will largely represent purchases of foreign machinery.

Table 1.—Mexico: Consumption ¹ of metalworking and finishing equipment, 1968, 1972, 1974 and 1978
(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, acces- sories, tools and dies	Metal finish- ing equipment	Other	Total
1968						
Production	2.24	1.68	.96	—	—	4.88
Imports	27.50	15.93	12.00	4.24	1.63	61.30
Exports	—	.23	—	—	—	.23
Consumption	29.74	17.38	12.96	4.24	1.63	65.95
1972						
Production	4.96	3.36	2.08	—	—	10.40
Imports	27.88	25.03	20.04	4.15	2.04	79.14
Exports .....	.24	.12	—	—	—	.36
Consumption	32.60	28.27	22.12	4.15	2.04	89.18
1974						
Production	6.72	4.64	2.88	.08	—	14.32
Imports	33.60	21.84	20.96	3.76	3.60	83.76
Exports .....	.40	.32	—	—	—	.72
Consumption	39.92	26.16	23.84	3.84	3.60	97.36
1978						
Production	15.60	8.40	6.00	.24	—	30.24
Imports	52.00	27.52	21.12	5.52	3.52	109.68
Exports	1.28	.64	—	—	—	1.92
Consumption	66.32	35.28	27.12	5.76	3.52	138.00

¹ Consumption equals production plus imports minus exports.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and Mexican trade source estimates.

Table 2.—Mexico: Imports of metalworking and finishing equipment, from selected countries, 1972
(in millions of U.S. dollars)

	U.S.	Germany	U.K.	Japan	Italy	Other	Total
Metal cutting machine tools	11.08	5.58	2.23	1.03	1.14	6.82	27.88
Metal forming machine tools	9.43	5.67	.90	.11	.62	8.32	25.03
Subtotal, metalworking equipment	20.49	11.25	3.13	1.14	1.76	15.14	52.91
Machine tool parts, accessories, tools and dies	10.43	6.50	.30	.13	.50	2.18	20.04
Metal finishing equipment	2.27	.40	.14	.17	.06	1.11	4.15
Other	1.02	.61	.02	.20	.02	.17	2.04
Total	34.21	18.76	3.59	1.64	2.34	18.60	79.14

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and Mexican trade source estimates.

The 1972 consumption of machine tool parts, accessories, tools and dies in Mexico was valued at \$22 million, of which all but about \$2 million consisted of imports. Imports are expected to account for 78% of the anticipated market of \$27 million in 1978. Domestic manufacturers are gearing up for a threefold increase in output of tooling and hope to raise their 1972 production value of \$2 million to \$6 million in 1978.

The close trade relationship between the United States and Mexico is reflected in the import market for machine tools. U.S. companies supplied 43%, or \$34.2 million, of Mexico's 1972 purchases of foreign-made metalworking equipment (see table 2). The United States is expected to improve this share to 45% in 1976, when imports of U.S.-made MFE should reach \$46 million. Germany, the only other foreign supplier with a major market share in 1972, provided 24% of that year's imports. Only 5% came from the United Kingdom, and 3% was purchased from Italy. Mexico is expected to diversify its sources of supply for metalworking equipment during the next several years, and the anticipated result is a moderate erosion of the German share in favor of Brazil and Argentina.

Mexico's 1972 purchases of metal cutting machine tools from the United States were valued at \$11 million, more than twice the amount that was imported from Germany. A breakdown of Mexico's 1972 imports of metal forming equipment reveals that the United States and Germany were again the major suppliers, with 33% and 23% market shares, respectively. U.S. manufacturers faced little foreign competition in the market for metal finishing equipment, accounting for more than 50% of Mexico's 1972 purchases. Purchases of \$10.4 million from the United States and \$6.5 million from Germany comprised the greater part of Mexico's 1972 imports of machine tool parts, accessories and dies.

Sales Opportunities

A market research study recently conducted in Mexico for the U.S. Department of Commerce, Office of International Marketing, revealed excellent sales opportunities for a variety of U.S.-made metalworking and finishing equipment. Interviews with

trade experts, responses from questionnaires mailed to principal machine tool users, and an analysis of import statistics detailed those product subcategories of particular interest to Mexican manufacturers.

Grinding machines.—The Mexican market for grinding machines was valued at slightly over \$7 million in 1972, of which all but \$320,000 was purchased from foreign suppliers. Consumption is projected to increase by over 13.5% a year during the 1972-76 period, boosting the market to \$15 million. Despite efforts to raise domestic production of grinding machines, local sources will probably account for only 7% (or \$1 million) of the 1978 purchases.

U.S. manufacturers in 1972 succeeded in capturing 43% of the grinding machine market, or \$2.2 million, and should continue to be Mexico's leading suppliers for the foreseeable future. Germany, with a 21% market share in the same year, was the only significant competition for the United States, and its manufacturers primarily offered conventional items. Local firms such as Sociedad General de Maquinaria S.A. (SOGEMA) and Fabricacion de Maquinas y Accesorios S.A. (FAMASA) began fabricating grinders in 1972.

U.S.-made grinding machines have achieved an excellent reputation in Mexico for their quality and reliability. The following types should be in demand for at least the next 4 years:

- Universal tool and cutter grinding machines
- Cutter-grinding machines
- Die grinding machines
- Pedestal tool grinders
- Surface grinders
- Universal internal and external grinding machine tools
- Thread or gear grinding machine tools
- Automatic production grinding machines

Universal grinder equipment represents one of the fastest growing segments of the market. An approximate 30% average annual increase in imports is calculated for the 1972-78 period, boosting purchases from only \$990,000 to \$4 million. The United States accounted for 34% of this market in 1972 as compared to a 21% share held by Germany.

Virtually all of Mexico's needs for surface grinders, thread grinding machine tools and automatic production grinding machines are met by imports. Mexico's imports of production grinding machines are expected to rise by 25% annually, climbing from \$520,000 in 1972 to \$2 million in 1978. U.S. grinding machines dominate the Mexican market; they accounted for 73%, or \$380,000, of 1972 purchases. The United States supplied 24% of the \$1.1 million import market for surface grinders in 1972 and should provide a substantial portion of the \$1.6 million market projected for 1978. U.S. manufacturers are expected to increase their sales of thread grinders. This market is anticipated to approach the \$1 million mark in 1978, rising from a 1972 base of \$220,000.

Mechanical presses and press brakes.—Mexican manufacturers absorbed \$10.7 million worth of mechanical presses in 1972, of which \$9 million represented imports. The anticipated growth of the country's motor vehicle industry, a substantial customer for presses, should help boost the market to over \$12 million in 1978. Imports of press brakes and small presses, however, are expected to remain at their 1972 level because local producers are gearing up to supply more of the country's needs for such presses.

Germany and the United States were the country's major foreign suppliers of mechanical presses in 1972, with 37% and 25%, respectively, of the import market. The major domestic competitors are Hidromex S.A., Maquinaria Occidental Mexicana S.A., Dreis and Krump-Izma S.A., and Cincinnati Mexicana S.A. de C.V.

Mexican users have expressed strong interest in acquiring the following types of mechanical presses:

- Diesetting presses
- Automatic, high-speed, strip, and coil feed presses
- Stamping presses

The strongest growth is predicted for imports of punch presses, which should expand from \$2.5 million in 1972 to \$4 million in 1978. The United States was second only to Germany in this market in 1972, having provided 37% of total imports.

Milling machines.—Consumption of milling machines is anticipated to reach \$7 million in 1978, reflecting a 9% average yearly rise over the \$4.2-million value in 1972. Imports are expected to climb from \$3.5 million to \$6.5 million during the 1972-78 period, reflecting an annual growth rate of nearly 11%. American suppliers maintain a strong competitive hold on this market, accounting for 35% of 1972 imports.

Local manufacturers, providing only a marginal quantity of milling machines in 1972, are striving to reach the \$1 million mark in production value for 1978. FAMASA, SOGEMA, and Mecamex are

the three most important Mexican producers of milling machines.

Germany and the United Kingdom were the United States' chief competitors on the 1972 milling machine import market with 14% and 13% shares, respectively. Japan provided 9% in the same year.

The following types of milling machines have been identified as potentially strong sellers for U.S. exporters.

- Universal milling machines
- Diesinking milling machines
- Vertical milling machines
- Tracer controlled and pantograph type milling machines

Mexican imports of vertical milling machines should increase by nearly 18% a year, rising from \$970,000 in 1972 to over \$2.6 million in 1978. The United States was by far the largest supplier in 1972, providing \$380,000 or 39%. The import market for universal milling machines should nearly double during the 1972-78 period, climbing to over \$2.7 million from a base of \$1.7 million. American manufacturers face keen competition from the United Kingdom, which had a 24% share of this market in 1972, and Germany, which recorded a 15% share, as against a U.S. share of 6%.

Drilling machines.—The market for drilling machines in Mexico is projected to double from \$2 million in 1972 to \$4 million in 1978. Imports should rise from \$1.9 million to nearly \$3 million during the same period. The United States, with a 46% share of the 1972 import market, is in an excellent position to increase sales throughout the remainder of this decade.

The country's leading manufacturers of drilling machines, including SOGEMA, Maquinaria Occidental Mexicana, Cia Vimalert de Mexico, S.A., and Manufacturera Tosa S.A., are actively trying to boost production from its 1972 value of \$2 million to \$5 million in 1978. Although Mexico is striving toward greater self-sufficiency in producing conventional drilling machines, the country will continue to rely on foreign suppliers for more advanced equipment. Germany, the only major country (except the United States) selling these machines to Mexico, supplied about 20% of the 1972 import market.

Trade sources foresee an expanding market for the following types of drilling machines:

- Radial drilling machines
- Deep hole drilling machines
- Turret head drilling machines
- Upright drills
- Numerically controlled drilling machine tools

The United States provides virtually all of the numerically controlled drilling equipment used in Mexico; since imports are projected to reach \$600,000 in 1978, this market should prove even more attractive to U.S. manufacturers.

Other sales opportunities.—Several other types of metalworking equipment should also offer sales possibilities for U.S. suppliers. For example, the country's imports of composite machine tools are expected to approach \$6 million in 1978, a 20% yearly increase over the 1972 value of \$1.7 million. Purchases of composite metal forming machinery from foreign sources should climb by 37% during the 1972-78 period, reaching \$2 million in the latter year. The import markets for wire drawing and stranding machines, and for metal parts painting equipment should more than double their 1972 levels, reaching \$2 million and \$2.4 million, respectively, in 1978.

Many prime Mexican industries now utilize numerically controlled machining centers and machine tools. As numerically controlled machine tools gain even greater acceptance, the prospects for increased sales of U.S.-made NC equipment are promising. Trade sources estimate growth of sales of NC machines from \$1.3 million in 1973 to nearly \$3 million in 1974. Numerical controls are seldom retrofitted in Mexico since most plants are too small and their production runs are too limited to justify such an expense.

However, the outlook for sales of programmable controls, digital readout and tracer controls is promising. This market, which reached \$1.2 million in 1973, is projected to have an annual average growth of 9% through 1978. These systems are gaining acceptance because of lower costs, compared to NC systems, and because they are more suitable to Mexico's industrial needs. Most Mexican users prefer U.S.-made systems because of their high quality and competitive price.

Many Mexican end-users have expressed interest in purchasing electrical discharge (EDM) and electrochemical (ECM) machining equipment, which is currently used on a limited basis in the country.

End-User Industries

Mexico's leading users of metalworking and finishing equipment, including its basic metal, transpor-

tation equipment, fabricated metal products, and machinery and equipment industries, are leaders in the push to enlarge and modernize the nation's industrial base. Between 1965 and 1970, the combined output of these users grew at an average annual rate of over 14%, increasing from a value of \$2.9 billion to \$5.6 billion (see table 3). Consolidation of these industries during that 5-year period reduced the number of firms from nearly 40,000 to roughly 16,000 but the number of employees increased from about 373,000 to more than 423,000.

The government maintains an active role in the country's economic development. Among the inducements offered to private enterprise are attractive tax rebates and exemptions from all or part of the import duties and taxes associated with capital investments in machinery.

Four industry sectors dominate Mexico's end-users of metalworking and finishing equipment. The combined 1970 output of these sectors amounted to about 56% of total end-user industry production (see table 4). The iron and steel products sector, with 23% of total production and 28% of capital investments, is the largest. The other end-user sectors—nonferrous metal products, motor vehicles, and motor vehicle parts and accessories—had a combined share of 32% of total production and 27% of total capital investment in 1970.

Major end-user firms and prospective customers in Mexico for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—Mexico*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Table 3.—Mexico: End-users of metalworking and finishing equipment, by industry, 1970

Industry	No. of manufacturers	Value of production (in millions of U.S. dollars)	Value of capital investment	No. of workers
Basic metal industries	334	1,926	92	69,979
Fabricated metal products	8,904	938	43	121,523
Machinery and equipment, except electrical	2,312	406	19	45,213
Electrical machinery and apparatus	1,062	896	35	88,530
Transportation equipment	833	1,228	48	70,173
Other manufacturing industries	2,721	179	20	28,194
Total	16,166	5,573	257	423,612

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Mexican trade source estimates.

Table 4.—Mexico: Principal end-user of metalworking and finishing equipment, by industry sector, 1970
(in millions of U.S. dollars)

Sector	No. of plants	Shipments	Capital expenditures
1. Iron and steel products ..	221	1,230	65
2. Nonferrous metal products	113	690	27
3. Motor vehicles parts and accessories	410	280	22
4. Motor vehicles, including tractors and trailers....	22	720	15
5. Wire and wire fabricated products	199	90	9
6. Record players, radio and TV receivers	84	200	6
7. Vehicle engines	5	90	6
8. Construction materials ..	287	110	6
9. Office and art supplies	52	30	6
10. Caps and other stamped and enameled products	285	80	5
Subtotal principal sectors	1,678	3,520	167
Subtotal all other sectors	12,921	1,720	68
Total all sectors	14,599	5,240	235

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Mexican trade source estimates.

Iron and steel products.—Mexico is expected to be completely self-sufficient in steel production by 1976. Four totally integrated companies—Altos Hornos de Mexico S.A. (AHMSA), Grupo Acero Hylsa, Fundidora Monterrey S.A., and Tubos de Acero de Mexico—supply 85% of the country's steel output. Steel production rose 195% from 1960 to a total of 4.4 million tons in 1972.

It has been estimated that the Mexican steel industry will need to invest about \$1.6 billion between 1974 and 1980 to meet capacity requirements in the latter year. Many iron and steel products manufacturers plan to expand existing facilities, and one new plant is under construction. Siderurgica Lazaro Cardenas Las Truchas S.A., scheduled to open in 1976, is expected to produce 1.5 million metric tons of nonflat steel products in its first year of operation and an estimated 2.5 million tons annually by 1980. This plant is expected to be capitalized at approximately \$640 million.

The major iron and steel products manufacturers buy a variety of equipment, since they are also directly or indirectly involved in making flat and structural steel products and in other metal fabrication activities through affiliates. U.S.-made metalworking and finishing equipment that should be highly salable to this sector includes the following:

- Drills, saws, and automatic machine tools
- Lathes

- Scrap presses
- Cold stretching and straightening machine tools for pipe, bar, and profiles
- Grinding machines
- Metal finishing equipment

The diversity of this sector has contributed to its high level of technological sophistication. Iron and steel product manufacturers' facilities generally incorporate the latest machinery.

Nonferrous metal products.—The major components of Mexico's nonferrous metal products industries are aluminum ingots and electrolytic copper. Aluminio S.A. de C.V. is the sole producer of aluminum ingot, and Cobre de Mexico S.A. is the only manufacturer of electrolytic copper.

Aluminio, which spent \$8 million on expanding production facilities in 1972, plans to further boost production capacity by 70,000 metric tons per year between 1975 and 1978. About 33% of its 1972 output was used for extrusions, 29% for electric conductors, and 27% for sheet and foil.

Cobre de Mexico also expects to substantially increase its output by 1978. Its 1972 production of 60,000 metric tons was transformed into wires and cables (38%), structures (29%), tubing (13%), alloy products (8%), brass products (8%), and sheets (4%). Other companies engaged in transforming aluminum and copper include Aluminio Industrial Mexicano, Reynolds Aluminio, Alcan, Cuprum, Condumex, Nacional de Cobre, and Conductores Monterrey y Phelps-Dodge.

The nonferrous metal products sector should require numerous U.S.-made metalworking and finishing products, including the following:

- Lathes and drills
- Screw machine tools
- Wire stranding and other fabricating tools
- Wire drawing, cutting, or straightening machine tools
- Presses
- Benders or rollers, including pipe benders
- Cold stretching and straightening machine tools for pipe, bar, and profiles
- Metal finishing equipment

Generally, the technology used by these industries is quite advanced as a result of technical agreements with foreign corporations.

Motor vehicles and motor vehicle parts and accessories.—Mexican production of motor vehicles increased 9% from 1971 to 1972 to reach 230,000 vehicles, of which about one-third were trucks. The industry's projected output for 1976 is nearly 250,000 vehicles, including 100,000 trucks. The total motor vehicle population in Mexico in 1976 is expected to be 1.7 million cars and 600,000 trucks.

Seven plants produced automobiles and trucks and three plants manufactured tractors and farm implements in 1973. All are U.S.-owned except for Volkswagen, Diesel Nacional S.A., and Nissan Mexicana. American firms with motor vehicle assembling

or manufacturing plants in Mexico are American Motors, Chrysler, Ford, General Motors, John Deere, International Harvester, and Massey Ferguson. The Mexican Government is the major stockholder of two large companies, Diesel Nacional S.A. (Dina trucks and Renault cars) and Vehiculos Automoteres Mexicanos S.A. de C.V. (American Motors).

Estimates show that full integration of the automotive industry at present production levels would require an investment of nearly \$2 billion. The sector is known to rely heavily on rebuilt, imported metalworking machine tools. Industry sources estimate that 30 to 40% of Ford's machine tools and 80% of VW's tools were imported, rebuilt equipment, and all of Nissan's machine tools are rebuilt.

Some 498 industrial plants in Mexico were engaged exclusively in the manufacture of automobile parts. Their sales in 1972 were valued at about \$330 million. The industry's plans to produce components not yet manufactured locally will require capital investments in both existing facilities and in new plants.

Both motor vehicle manufacturers and the manufacturers of parts and accessories will purchase many types of machine tools and equipment. U.S. exporters can expect their highest sales potential among these types of equipment:

- Lathes and drills
- Grinders
 - crankshaft
 - piston rod
 - bushings
 - pistons
- Presses, especially stamping
- Castings
 - gearbox cases
 - monobloc heads
 - intake and exhaust manifolds
 - engine components for tractors
 - automobile piston casings
- Metal finishing equipment

Domestic Manufacture of Metalworking and Finishing Equipment

Local producers of metalworking and finishing equipment are expected to provide up to 22% of Mexico's MFE consumption by 1978, compared to about 12% in 1972. The industry's total output, which amounted to \$10.4 million in 1972, is expected to nearly triple to approximately \$30 million in 1978.

The industry's major products are lathes and drilling machines. Other substantial production items are milling machines, hydraulic and mechanical presses, shears, benders, press brakes, parts, accessories, and tools and dies. There are 10 Mexican firms making metal cutting type machine tools and

about 15 companies manufacturing metal forming machines.

Most lathes manufactured in Mexico are various models of surfacing, sliding, and screw cutting lathes. Annual output in 1973 was about 420 units. However, the start of production at the new Fabrica Nacional de Maquinas Herramientas plant, which is expected initially to produce 850 units in 1975, will raise Mexico's total annual output to approximately 1,300 units or more. The Mecamex company plans to manufacture 100 center lathes, with hydrocopying attachments, in 1975.

Bench and round column drilling machines are made by several companies. One company has a small output of gang drilling machines. Of the several manufacturers of knee-type machines, one plans to make universal knee-type machines as well and another plans to produce horizontal boring and milling machines. Milling machine production, roughly 100 units per year, should grow to more than 400 units per year by 1975. Among grinding machine producers, the SOGEMA company makes hand-fed surface grinding machines and FAMASA is developing plans to produce about 60 universal cylindrical grinding machines a year by 1975. FAMASA also plans to make gear hobbing machines.

Eight Mexican companies produce a variety of sizes of hydraulic and mechanical presses and mechanical press brakes. The major producers of shears and benders are Cor-Mex S.A. (bar-cutters, guillotines, and benders), Dreis and Krump-Izna S.A. (foot shears, mechanically driven shears, and hand-operated brakes), and Cincinnati Mexicana (mechanical brakes and shears).

Under the impetus of the Mexican Government's export promotion programs, MFE exports are expected to rise from a meager \$360,000 in 1972 to nearly \$2 million in 1978. Roughly 67% of total metalworking and finishing equipment exports are metal cutting machine tools; in 1974, however, sales of metal cutting machine tools abroad accounted for only 55% of total exports. The domestic industry has specific plans to increase exports of lathes and milling machines.

A few domestic manufacturers operate as subsidiaries of foreign corporations. Subsidiaries of U.S. firms are: Maquinaria Occidental Mexicana S.A., a subsidiary of E. W. Bliss Co.; Manufacturera Tosa S.A., a subsidiary of the Rockwell Manufacturing Company; Dreis and Krump-Izna S.A., a subsidiary of the Dreis and Krump Manufacturing Co.; and Cincinnati Mexicana S.A. de C.V., a subsidiary of Cincinnati, Inc.

FAMASA is a licensee of two Czechoslovakian companies, Tos and Trencim. Mecamex has licensing agreements with the French firms of Murger and Ramo. Fabrica Nacional de Maquinas Herramientas is licensed by a Yugoslav company, Prvo-

majaska. Several other companies also have arrangements to procure technical know-how from foreign corporations.

Trade Regulations and Practices

Mexico imposes specific import duties on about 38 types of metalworking and finishing equipment which range from a low of .05 pesos per gross kilogram to a high of 10 pesos per gross kilogram. It also levies an ad valorem duty averaging 25% on all types of MFE except certain parts and accessories. The ad valorem duty is levied on the invoice value or the Mexican official valuation (148.00 pesos per legal kilogram), whichever is higher. The country's tariffs favor Latin American Free Trade Associations (LAFTA) agreement nations.

Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4127, Main Commerce Building, Washington, D.C. 20230.

Mexico's general import policies, including the import substitution program, are designed both to protect infant domestic industries and to develop new industries. The Mexican government attempts to discourage imports, whenever there is evidence that an item can be obtained locally, by requiring the buyer to seek an import license from the Secretariat of Industry and Commerce. The license may be granted or the would-be importer may be referred to an interested local manufacturer that can produce or supply the product.

Nontariff controls, such as import limitation and tight credit for purchasers of industrial equipment, have been instituted to fight inflation and offset the heavy trade deficit that Mexico has experienced since 1973. All foreign interest payments connected with the financing of purchases made through foreign creditors are subject to a 10% withholding tax.

An estimated 2,000 foreign producers of metalworking equipment are represented in Mexico. There are some 30 major distributors of imported MFE, the largest serving as agents for hundreds of foreign and local companies.

Tecnicos Argostal S.A., a German subsidiary, is a typical distributor that represents approximately 15 U.S. manufacturers and 24 German manufacturers, as well as 7 British, 7 Italian, and 3 Japanese firms. Forel de Mexico S.A., whose clients include about 22 U.S. companies, and Leon Weill S.A., representing 9 U.S. companies, are other leading distributors of U.S.-made equipment. Mexico has only three direct sales organizations of foreign producers, one of them handling Cincinnati's line of machine tools and another importing NC machine tools from Italy's Olivetti. In general practice,

many foreign firms have agreements with several local distributors under which they pay a commission to the one that first brings the sales opportunity to the company's attention.

Possibly the greatest asset for U.S. suppliers entering the Mexican market is Mexico's long-time exposure to U.S. products and business practices. Competing nations, notably Germany and Italy, have sought to offset that advantage through excellent technical manuals and other promotional literature. Competitive financing is important in the Mexican market. Cash in advance is customarily sought in sales of small machine tools to new customers. Some sales are made on a 24-month payment basis, with a 15 to 18% rate of interest. The down payment on larger transactions may run from 20 to 25%. Some agents for foreign suppliers offer special financing arrangements.

Forel de Mexico, for example, offers financing on imports from the United States through the Ford Motor Credit Co., with interest rates of 5.5% for 3 years on the total loan, or 7.5% on a 5-year loan. The latter is equivalent to about 9% on the balance. German and Soviet imports can be bought through Tecnicos Argostal and Doroco S.A., respectively, with 7-year loans at very reasonable interest rates. Eximbank loans are obtainable in a proportion of 50-50 at interest rates between 8 and 8.5%.

Technical Requirements

The main regulatory organization issuing standards for the production and use of metalworking equipment in Mexico is the Direccion General de Normas (DGN), whose offices are within the Departamento de Normalizacion Nacional, Avenida Cuauhtemoc No. 80, 1er Piso, Mexico 7, D.F. Since the DGN generally uses SAE, DIN, and ASTM standards, Mexican standards are normally identical to those in the United States. There is also a private regulatory organization, Comité Consultivo Nacional de Normalizacion de la Industria Siderurgica, at Amores No. 338, Mexico 12, D.F.

Designs and drawings, material specifications, tools, jigs, fixtures, gauges, patterns, etc., must be in the metric system in conformity with International Standards Organization (ISO). The metric system is used in Mexico, but inches are sometimes employed in measuring.

Mexico's electricity supply is not yet standardized. Most of the nation is supplied with a 60-hertz, 110-volt current. The exception is the Central System in Mexico's principal industrial region. The Central System accounts for 39% of total consumption and covers the States of Mexico, Morelos, Hidalgo, and parts of the Distrito Federal, Queretaro, Tlaxcala, Guerrero, and Michoacan, which

operate on a 50-hertz, 125-volt alternating current. The areas now converting to 60-hertz, 110-volt current are Mexico City and the States of Mexico, Hidalgo, Morelos, and parts of Guerrero.

The nation in 1973 began a 7-year program to standardize the electricity supply based on 60-hertz, 125-volt, single-phase, and 220-volt, 3-phase current. Until 1976, therefore, MFE exported to Mexico must be operable on both 50- and 60-hertz power supplies.

Published national standards for metalworking and finishing equipment in Mexico may be obtained

through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230:

"The Market for Metalworking and Finishing Equipment in Mexico," DIB 74-06-501, January 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Mexico. The table gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by Mexico in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Mexico: Imports of metalworking and finishing equipment, 1968-78 alternate years
(in millions U.S. dollars)

Equipment	1968	1970	1972	1974	1976	1978
<i>Metal Cutting:</i>						
Universal engine lathes	3.65	3.01	2.74	2.40	2.00	1.60
Semiautomatic turret lathes	1.27	1.38	1.26	1.20	1.20	1.20
Repetition and turret lathes .....	.49	.78	.35	.40	.56	.64
Automatic lathes	1.80	2.85	2.79	2.00	2.00	2.00
Vertical lathes .....	.31	.53	.68	.96	1.20	1.60
Other lathes .....	.40	.22	.49	.80	.96	1.12
Whetters (emery grinders) or polishing MT* .....	.44	.69	.70	.80	.96	1.12
Tool whetters .....	.34	.33	.63	.80	.96	1.12
Draw plate die grinding MT .....	.02	.02	.09	.16	.32	.48
Other tool grinders .....	.18	.42	.26	.40	.32	.56
Hydraulic centerless grinders .....	.52	.60	.27	.40	.48	.40
Surface grinders .....	.71	.91	1.10	1.20	1.36	1.60
Universal internal and external and grinding MT	1.63	.73	.99	1.20	2.00	4.00
Crankshaft grinding MT .....	.30	.58	.21	.24	.40	.56
Piston rod grinding MT .....	.02	.08	.03	.08	.08	.08
Bushings grinding MT .....	.05	.05	.06	.08	.08	.08
Cylinder honing MT .....	.10	.10	.10	.16	.16	.16
Roller grinding MT	—	.12	—	.16	—	.32
Thread or gear grinding MT .....	.05	.14	.22	.40	.64	.96
Valve rectifiers .....	.10	.03	.14	.08	—	.16
Cylinder reboring MT .....	.34	.27	.26	.24	.24	.24
Piston grinding MT .....	.02	.02	.01	.08	—	.08
Monobloc bearing grinders .....	.01	.01	.01	—	.08	—
Cylinder polishing MT .....	.13	.03	.04	—	.08	.08
Sawblade whetters .....	.06	.07	.06	.08	.08	—
Other grinding MT .....	.23	.60	.67	.96	1.20	1.60
Hobbing machines (gear cutters) .....	.41	.48	.47	.56	.96	1.20
Universal milling machines	1.65	1.95	1.68	2.00	2.40	2.72
Horizontal milling machines .....	.74	.45	.51	.32	.24	.24
Vertical milling machines .....	.54	.66	.97	1.44	2.00	2.64
Milling MT for graphic arts .....	.12	.03	.02	.08	—	.08
Other milling and hobbing MT n.e.c. ....	.64	.12	.34	.40	.56	.80
Radial planing MT .....	.47	.26	.37	.56	.80	.96
Beveling machines .....	.06	.04	.19	.24	.24	.40
Chucking MT (less than 25 tons)	1.02	.89	.82	.96	1.12	1.20
Chucking MT (more than 25 tons) .....	.01	.30	.30	.40	.56	.80
Other planing MT .....	.31	.29	.27	.40	.56	.56
Mechanic or hydraulic filing MT .....	.07	.12	.10	.16	.16	.24
Mortising machines .....	.09	.02	.02	.08	.08	.16
Broaching machines	—	.33	.15	.32	—	.56
Other planing machines .....	.04	—	.05	.08	.24	.40
Band saws .....	.07	.22	.18	.40	.40	.24
Disc saws.. ..	.21	.36	.27	.56	.40	.64
Hydraulic gate saws .....	.12	.08	.07	.16	.16	.16
Other saws n.e.c. ....	.04	.06	.06	.16	.24	.32
Composite MT .....	.81	.85	1.89	2.80	4.00	5.60
Copying MT .....	.06	.08	.08	.16	.40	.64
Stippling MT for humid stretching .....	.02	.09	.02	.08	.16	.16
Other stippling MT .....	.10	.06	.04	.08	.08	.08
Threading MT .....	.09	.12	.13	.24	.24	.32

Mexico: Imports of metalworking and finishing equipment, 1968-78 alternate years—Con.

(in millions U.S. dollars)

Equipment	1968	1970	1972	1974	1976	1978
Other threading MT .....	.40	.37	.26	.24	.32	.40
Bench drills (19 mm or less) .....	.06	.13	.18	.24	.40	.56
Column drills (up to 38 mm) .....	.24	.37	.30	.24	.24	.24
Other drills	2.22	.94	1.12	.80	.96	.96
Radial drills .....	.26	.26	.18	.24	.40	.24
Centerers .....	.01	.06	.02	.08	.08	.08
Other metal cutting MT .....	.14	.36	.47	.64	.80	.96
Transfer (complex) machines .....	.94	.27	.74	.80	1.20	1.20
NC drilling MT	1.03	.14	.11	.24	.40	.64
NC grinding MT .....	.20	.58	.52	.80	1.20	1.60
NC boring MT .....	.10	.02	.02	.16	.16	.24
Other NC MT n.e.c.	1.05	.78	.80	1.20	1.60	2.00
Total	27.50	26.71	27.88	33.60	41.12	52.00
<i>Metal Forming:</i>						
Drop hammers .....	.25	.08	.10	.16	.24	.24
Eccentric presses .....	.98	.78	1.77	.96	2.80	1.44
Wire drawing machines .....	.84	2.43	.47	.48	1.20	.80
Riveters .....	.15	.18	.50	.40	.64	.64
Wire cutting or straightening MT .....	.14	.11	.11	.16	.16	.24
Pipe widening MT .....	.09	.02	.22	.08	.40	.16
Cutting or boring MT .....	.76	.72	1.00	.80	1.28	.96
Shears or guillotines	1.03	.43	.77	.40	.40	.40
Stamping presses	1.63	1.63	2.50	2.80	4.00	4.00
Spring making MT .....	.11	.26	.37	.56	.64	.80
Wire cloth making MT .....	.11	.26	.01	.24	.16	.32
Screw, nut, nail, staple, thumbtack, etc., making MT, n.e.c. ....	.71	.65	.79	.88	1.04	1.20
Pin and safety pin making MT .....	.01	—	.06	.08	.08	.08
Composite metal forming MT .....	.71	.88	1.46	1.60	1.60	2.00
Mechanical and pneumatic presses	1.22	.78	1.44	1.04	2.00	1.36
Cable end squaring machines	—	—	—	—	.40	—
Pipe chuck straighteners	—	.01	—	—	.08	—
Pipe, bar, and profile cold stretching MT .....	.46	.06	.60	.16	.80	.24
Bar, pipe, sheet and profile cold straightening MT .....	.07	.12	.39	.96	1.60	1.60
Swaging machines .....	.09	.06	.09	.16	.16	.24
Mechanic drop forging hammers .....	.17	.18	.06	—	.08	—
Mechanic double mount press .....	.20	.18	2.86	.40	.56	.72
Friction presses .....	.05	.06	.02	—	.08	—
Horizontal rocking presses .....	.09	.05	.20	.24	.24	.40
Mechanical bending (folding) machines, motor-driven ..	.11	.10	.10	.16	.24	.32
Other benders or rollers .....	.54	.73	.68	.96	.96	1.20
Pipe bending machines .....	.08	.10	.13	.24	.24	.24
Sheet planers .....	.04	—	.05	—	.80	.16
Other material forming MT .....	.55	.23	.51	.64	.64	.64
Container making MT .....	.69	.83	.52	.40	1.04	.56
Pipe from sheet forming MT .....	.01	.68	.01	—	1.20	.16
Other forming and cutting MT .....	.05	.06	.12	.16	.24	.24
Wire, cable and thread fabricating winding and twist- ing machines	1.10	2.75	1.45	2.88	2.08	3.76
Hydraulic sintering presses .....	.02	.18	.02	.24	.48	.16
Sintering presses .....	.05	.07	.01	—	.24	.08
Hydraulic presses to compress scrap iron .....	.08	.02	.06	.40	—	.16
Briquetting presses .....	.02	.03	—	.08	—	.24
Other MT n.e.c. ....	.17	.30	4.36	2.00	1.12	.64
Hydraulic presses	2.03	1.39	.90	.80	.64	.64
Electricity driven presses .....	.41	.15	.32	.16	.24	.24
Hydraulic presses with rotary clamps and rollers .....	.11	.01	—	.16	.08	.24
Total	15.93	17.56	25.03	21.84	30.88	27.52

Mexico: Imports of metalworking and finishing equipment, 1968-78 alternate years—Con.
(in millions U.S. dollars)

Equipment	1968	1970	1972	1974	1976	1978
<i>Other Metalworking:</i>						
Electroerosion equipment .....	.32	.47	.18	.56	.16	.48
Extrusion presses .....	.02	.47	.65	.96	.08	1.04
Gearbox case casting molds	—	.03	—	.08	—	.16
Car monobloc casting molds .....	.21	.38	.18	.16	.24	—
Monobloc head-molds .....	.07	.23	—	—	.24	.08
Intake manifold molds .....	.08	.02	—	.08	—	—
Exhaust manifold molds	—	.05	—	.16	—	.08
Bearing head casting molds .....	.06	—	—	.08	—	.24
Automobile part casting molds n.e.c. ....	.01	.07	.01	.08	.16	.16
Agricultural tractor engine components molds .....	.04	—	—	.08	—	.08
Molding boxes .....	.06	.10	.01	.08	.16	.08
Differential housing molds	—	.13	—	.08	—	.08
Rear axle cover molds	—	—	.04	—	.08	—
Agricultural tractor component molds	—	—	.08	—	.08	—
Metals injection or compression steel molds .....	.26	.30	.45	.56	.48	.64
Agricultural tool casting molds	—	—	—	.08	—	—
Car piston casting molds .....	.02	.01	.02	—	.08	—
All other molds, patterns, or parts n.e.c. ....	.48	.25	.42	.56	.24	.40
Total	1.63	2.51	2.03	3.60	2.00	3.52
<i>Parts and Accessories for MT:</i>						
Tool holders for lathes .....	.41	.52	.67	.80	.96	1.12
Punch holders for eccentric presses .....	.01	.01	.02	—	.08	—
Chucks .....	.30	.61	.58	.40	.64	.80
Die holders .....	.02	.01	.01	—	.08	.08
Rotative tips for lathes .....	.02	.04	.03	—	.08	.08
Quick change chucks .....	.01	.03	.02	.08	.08	—
Other holders n.e.c. ....	.63	.57	.67	.80	.64	.80
Universal hydrocopiers .....	.03	.04	.04	.08	.08	.08
Copying devices .....	.01	.02	.02	—	.08	—
Parts for lathes .....	.18	.27	.28	.24	.32	.32
Pneumatic or hydraulic cylinders for MT automation ..	.10	.23	.10	.16	.32	.24
Parts for grinding machines .....	.01	—	.01	—	.08	—
Parts for wire drawing MT .....	.05	.04	.09	.08	.08	.08
Parts for cutting MT .....	.03	.02	.06	.08	.08	—
Eccentric press bases	—	—	.01	—	—	—
Parts for benders or rollers .....	.03	.10	.05	.16	.08	.24
Parts for shears .....	.14	.10	.06	.24	.16	.16
Parts for pipe chuck straighteners .....	.02	.02	.01	—	.08	—
Vises .....	.02	.03	.10	—	.08	—
Threading heads .....	.05	.13	.10	.16	.16	.08
Parts for universal grinding MT .....	.03	.01	.05	—	.08	.08
Parts for universal milling MT .....	.07	.09	.20	.48	.56	.56
Parts for extrusion presses .....	.10	.04	.07	—	.08	—
Parts for cold drawing frames	—	.02	.01	—	.08	—
Parts for cold straightening MT .....	.01	.02	.01	.08	—	—
Parts for swaging MT	—	.01	.01	—	—	.08
Conical or straight rollers for straighteners .....	.01	—	.02	—	—	—
Lathe rectifying devices .....	.01	.02	.01	—	—	.08
Parts for container making MT .....	.18	.15	.34	.16	.40	.24
Parts for drop forging hammers	—	.02	.12	—	.32	—
Other parts	—	.26	.21	.08	.24	.08
Parts and accessories for MT n.e.c. ....	.90	.80	.78	1.60	2.40	2.00
Total	3.38	4.23	5.76	5.68	8.32	7.20

Mexico: Imports of metalworking and finishing equipment, 1968-78 alternate years—Con.
(in millions U.S. dollars)

Equipment	1968	1970	1972	1974	1976	1978
<i>Tools and Dies for MT:</i>						
Toothed bits for bars .....	.08	.05	.02	.08	—	.08
Diamond bits .....	.05	.06	.05	—	.08	—
Threading dies .....	.38	.54	.52	.64	.40	.56
Die plates .....	.14	.15	.09	.08	.08	—
Milling cutters .....	.21	.38	.51	.72	.64	.80
Diamond draw plate dies	—	.01	.01	—	.08	—
Burrs or chisels .....	.10	.01	.07	.08	.08	.08
Reamers .....	.22	.10	.06	.08	.08	—
Dies	1.46	2.79	7.18	8.00	8.00	5.60
Forging dies .....	.26	.73	.37	.80	.40	.88
Broaches .....	.15	.19	.19	.24	.32	.32
Boring bits, less than 100 kg n.e.c.	1.58	.45	.89	.80	.56	1.20
Boring bits, more than 100 kg n.e.c. ....	.53	.15	.52	.24	.56	.32
Cones for boring drills .....	.24	.06	.02	—	.08	—
Dies or master dies, less than 1 ton	—	.06	.27	.40	.40	.56
Dies or master dies, more than 1 ton	—	.03	—	—	.08	—
Taps	—	.16	.04	.08	—	.08
Carbide tipped bits, less than 960 g	—	.02	.03	—	.08	—
Other carbide tip bits .....	.43	.11	.11	.08	.08	—
All other interchangeable tools n.e.c.	1.63	1.41	2.45	2.00	3.20	2.40
Knives or cutting blades .....	.58	.75	.81	.88	1.04	1.04
Carbide plates, rods, tips, etc. ....	.58	.12	.07	.08	—	—
Total	8.62	8.33	14.28	15.28	16.24	13.92
<i>Metal Finishing:</i>						
Metal parts cleaning equipment	1.24	1.22	2.09	1.20	1.60	1.68
Metal parts deburring equipment	—	—	—	.08	.08	.08
Metal parts hardening equipment .....	.22	.62	.02	.08	.40	.56
Metal parts painting equipment .....	.98	1.22	1.66	2.00	2.00	.80
Metal parts plating equipment	1.80	.32	.38	.40	.40	.80
Total	4.24	3.38	4.15	3.76	4.48	5.52
Total metalworking and finishing equipment	61.30	62.72	79.14	83.76	102.00	109.68
<i>Miscellaneous:</i>						
Used machine tools	20.00	22.00	26.00	30.00	36.00	44.00

* MT indicates metalworking machine tools; NC indicates numerically controlled equipment.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Mexican trade source and estimates and official trade statistics.

People's Republic of China

Metalworking and finishing equipment (MFE)¹ will find a growing market in the People's Republic of China (PRC) as that nation implements a policy of industrial expansion intended, in the long run, to provide greater self-sufficiency. Moreover, the PRC has indicated a strong interest in importing advanced Western products and technology, including the purchase of entire plants, to spur the development of its priority industries.

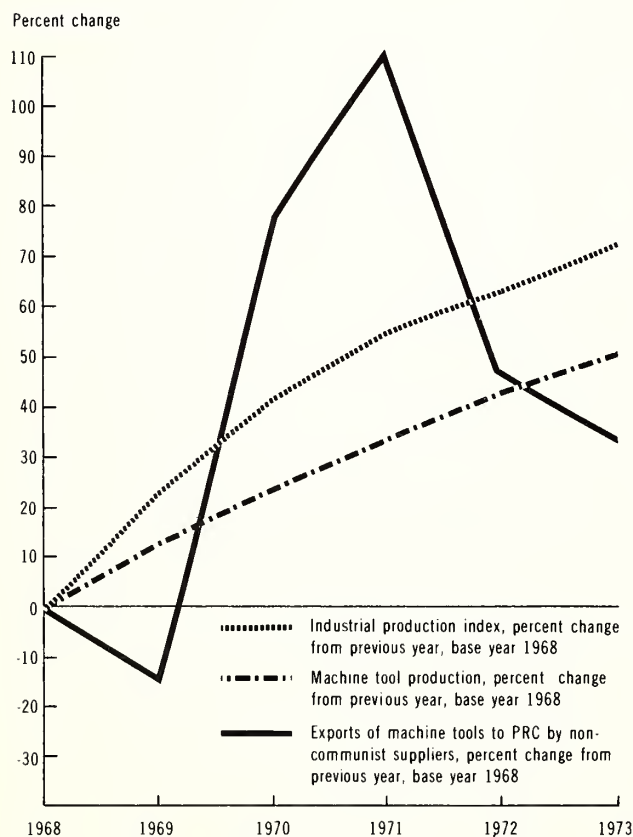
The industrial sector is the fastest developing segment of the economy; its contribution

to the gross national product (GNP), estimated at \$172 billion in 1973, is about equal to that of the agricultural sector. The industrial production index rose by an average of 14.1% annually between 1968 and 1973, nearly double the 7.8% average rate of GNP increase during the same years (see table 1). Current emphasis is on industries that support the frequently hard-pressed agricultural sector, but observers believe that the trend is toward rising investment levels throughout the industrial sector. They further estimate that a considerable expansion of basic industry will take place in the near future.

China, which has adopted a policy of attaining maximum self-sufficiency in machine tool production, has added steadily to its machine tool building capacity in recent years and currently produces a wide range of basic machine tools. In 1973, the country manufactured an estimated 65,000 machine tool units and imported machine tools, parts, and accessories valued at more than \$20 million. China will continue to look to foreign suppliers for selected equipment items. Imports will be confined to machine tools required for priority sectors or to prototypes for copying.

The Chinese can probably produce sufficient general-purpose machine tools required for their needs. Imports will consist mainly of special-purpose machine tools and precision tools in the general-purpose line. The Chinese will continue to import selected parts, accessories, and tools and dies for

People's Republic of China: Trends in Industrial Growth, Production, and Foreign Purchases of Machine Tools, 1968-73



Source: U. S. Government. 1973 exports are partial data from six major suppliers only.

¹ Machinery encompassed in this study under the category "metalworking and finishing equipment" includes machine tools for working metals, both metal cutting and metal forming types; parts, accessories, tooling, and dies for machine tools; inspection, measuring and testing equipment; and metal parts cleaning and finishing equipment for the metalworking industries.

The People's Republic of China releases little information and virtually no statistics concerning its economy. This survey therefore is based extensively on the opinions of informed observers, and on approximate data developed by U.S. Government or trade sources through the collation and interpolation of information from diverse sources.

Projections are founded on the assumption that current economic policy trends will continue: i.e., a high priority for industrialization and somewhat greater openness in trade relations with free market countries, including the United States.

machine tools, in part because of difficulties they experience in producing the high-grade steels and alloys needed to manufacture tools. The Chinese rely heavily on hand operations for metal parts and finishing, as well as domestic production of basic vibrating and similar machinery used for this work. However, a limited import market for metal finishing equipment and processes may develop in the more sophisticated and specialized industries. Imported metalworking equipment will go mostly to plants producing trucks and other transport equipment, power generation equipment, metallurgical equipment, tractors, and diesel engines, as well as to the machine tool building industry.

The People's Republic of China is selective in its choice of import suppliers, placing its orders not only on the basis of priorities, price, and technical specifications but also in consideration of broader political and economic objectives. China has diversified its purchases of MFE to include most major suppliers, both Communist and non-Communist, and has avoided dependency on any one source.

MFE exports to China by Communist countries, formerly the major source of supply, remain extensive. Partial data available does not indicate their total level; information could not be obtained on MFE sales to China by East Germany, a major supplier, and by Hungary and Rumania, also important suppliers.

The non-Communist countries' MFE exports to

China consist primarily of advanced machinery. Sales demonstrated a growth trend through 1971, when a peak level of \$61 million was recorded (see table 2). Analysts believe that the decline between 1971 and 1972 reflects an increase in the capacity of domestic industry rather than a shift in policy or development priorities. Long-range projections suggest, however, that the import trend will reverse and show moderate increases as Chinese industrial expansion and modernization necessitate greater stocks of MFE of improved quality.

The rising level of imports, in combination with recent Chinese policy favoring trade with the United States, should enable U.S. manufacturers to establish an important position in the market along with Japan, West Germany, Switzerland, the United Kingdom, and Italy. An early 1974 sale of automotive gear cutting and finishing equipment by the Gleason Works (the initial sale of U.S.-made machine tools to the People's Republic of China) is indicative of the fact that U.S. suppliers can offer equipment incorporating price, quality, and product specifications that are attractive to China.

Sales Opportunities

A market study recently conducted for the U.S. Department of Commerce, Office of International Marketing, has identified the items that offer favorable prospects to U.S. exporters. The study includes first-hand information obtained at the 1973 Fall Chinese Export Commodities Trade Fair held in Kwangchow (Canton), as well as from interviews with Chinese trade officials and third country suppliers' representatives who have been active in selling to China.

The best sales prospects are for high-precision, large-scale, and special-purpose machine tools for China's priority industries. Occasional opportunities may also arise for sales of general-purpose equipment.

The specific equipment categories with the greatest sales potential are described in the following paragraphs.

Table 1.—Peoples Republic of China, Key Economic Indicators

Year	GNP ¹ (billions of U.S. dollars)	Industrial ¹ production index (1957=100)	Machine ¹ tool (MT) production (units x 1,000)	Exports ² of MT to PRC (millions of U.S. dollars)	Total imports ¹ (billions of U.S. dollars)
1968	118	164	40	28	1.82
1969	130	202	45	24	1.83
1970	147	240	50	46	2.24
1971	159	271	55	61	2.31
1972	161	294	60	22	2.77
1973	172	319	65	19 ³	4.5

¹ Estimate.

² Data from non-Communist nations only.

³ Partial data from six major suppliers only.

Source: U.S. Government.

Table 2.—People's Republic of China: Exports of metalworking equipment to the PRC by selected countries
(in millions of U.S. dollars)

Year	Product	Germany	France	Italy	Japan	U.K.	Switzer- land	Sweden	Total non- Com- munist	U.S.S.R.	Czecho- slovakia	Poland
1968	Machine tools for working metals	12.52	1.80	2.71	3.61	.56	5.82	.03	28.23	.25 ^a	5.86 ^a	176 ^b
	Parts and accessories for machine tools ..	.48	.04	.02	.43	.05	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1970	Machine tools for working metals	6.22	3.54	7.57	16.62	3.08	8.29	.08	45.95	1.40 ^a	6.21 ^a	167 ^b
	Parts and accessories for machine tools ..	.25	.02	—	1.06	.03	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1971	Machine tools for working metals	15.97	1.63	9.08	23.31	3.36	7.61	.11	61.00	3.84 ^a	11.89 ^a	242 ^b
	Parts and accessories for machine tools ....	.23	.01	¹	.73	.04	n.a.	¹	n.a.	n.a.	n.a.	n.a.
1972	Machine tools for working metals	5.43	.79	3.52	6.53	.21	4.81	.10	21.98	4.82 ^a	5.70 ^a	168 ^b
	Parts and accessories for machine tools ..	.33	—	—	.33	.02	.15	.01	n.a.	n.a.	n.a.	5 ^c
1973	Machine tools for working metals	3.24	1.13	.56 ²	8.14	.58	4.49	²	n.a.	1.54 ³	n.a.	n.a.
	Parts and accessories for machine tools ..	.37	.02	—	.33	—	.20	n.a.	n.a.	n.a.	n.a.	n.a.

¹ Less than \$10,000.

² First three quarters only.

³ Metal cutting machine tools only.

⁴ Metalworking equipment.

⁵ Units of machinery.

⁶ Tons.

Sources: *Statistics of Foreign Trade, Volume III, 1968, 1970, 1971*, Organization of Economic Cooperation and Development; *World Trade Annual, 1968, 1970, 1971*, the United Nations Statistical Office; and U.S. Government officially published trade statistics of individual countries.

Gear cutting and finishing machinery.—The People's Republic of China relies on foreign manufacturers for much of its supply of high-production and heavy-duty gear producing equipment and for equipment of special accuracy or durability. The Chinese serially produce a gear hobbing machine for hobbing spur, helical, and worm gears. The maximum outside diameter of spur gears cut on this machine with outer support is 450 millimeters (mm.) and, without outer support, 800 mm. For helical gears, the maximum outside diameter for a helix angle of 30 degrees is 500 mm., and for a helix angle of 60 degrees the maximum outside diameter is 190 mm. The machine is provided with a hydraulic device for elimination of backlash between elevating feedscrew and nut, thus permitting climb hobbing (vertical feed upward) in addition to hobbing (vertical feed downward).

The Chinese also produce at least two other models of gear hobbing machines, as well as gear shapers, a gear grinder, a straight bevel gear generator, and other gear cutting machinery. There are indications that internal demand exceeds both quality requirements and production levels for gear cutting and finishing equipment.

In the past, most PRC purchases were from Japan or the United Kingdom, although the market is now accessible to U.S. suppliers as well. Japan was a principal foreign supplier of gear cutting and hobbing equipment to China between 1968 and 1972. Major sales by Japanese firms included the following:

1969—Hamai Company: three gear hobbing machines ranging between 30 x 30 mm. and 120 x 160 mm.—\$22,000

Masuda Manufacturing Company: one special gear cutting machine—\$83,000

1970—Kashifuji Works: four high-production gear hobbing machines—\$100,000

Tokyo Kikai Seisakusho Ltd.: 31 gear cutting machines—\$600,000

1971—Hamai Company: five gear hobbing machines—\$27,000

Kashifuji Works: two all-purpose hobbing machines—\$55,000

Nihon Kikai Seisakusho Company: four heavy-duty gear hobbing machines—value unspecified

Kanzaki Kokyu Koki Manufacturing Company: two gear cutters—\$28,000

Tokyo Kikai Seisakusho Ltd.: five gear shapers—\$14,000

1972—72 gear hobbing machines—value and manufacturers not specified

Imports of heavy-duty and high-production gear cutting and hobbing tools are expected to expand. The high-priority transportation and machinery industries require such equipment and domestic manufacture cannot meet requirements. The future import demand will focus on tools with high capacity and accuracy, particularly:

- Hobbing machines for the production of very small or very large gears
- Hobbing machines for the production of spur, helical, and herringbone gears
- Bevel gear generators
- Gear cutters for the production of spur, helical, herringbone, internal, and cluster gears
- Gear shaping machinery

Grinding machines.—The Chinese import market for grinding equipment is likely to remain extensive in view of persisting engineering difficulties that hamper domestic production, especially in large-size and high-precision grinders. China produces all major types of grinders. Among domestically produced surface grinding machines is a horizontal unit capable of handling a workpiece of 1,000 x 300 x 400 mm. and of table speeds of 3-28 meters per minute (m./min.). Another permits a maximum workpiece dimension of 630 x 200 x 320 mm. and table speeds of 1-18 m./min. Other models of horizontal surface grinders are produced.

At least two internal grinders are in serial production in China; one model has a grinding diameter of 12-100 mm. and maximum length of bore ground up to 130 mm.; spindle speeds are variable to 18,000 r.p.m.; another has a grinding diameter of 50-200 mm. with a maximum grinding bore length of up to 200 mm. and variable spindle speeds to 12,100 r.p.m. Other domestically produced grinding machines include universal cylindrical grinders, centerless grinders, camshaft grinders, gear grinders, tool and cutter grinders, thread grinders, and honing machines.

Japan and Italy have been major suppliers in recent years. Principal sales include these items:

1968—Tsugami Manufacturing Co. Ltd.: four internal grinders—\$389,000

Okamoto Machine Tool Works Ltd.: two internal grinders—\$222,000

1969—Yamada Koki Co., Ltd.: 10 internal grinders—\$694,000

Okamoto Machine Tool Works, Ltd.: one internal grinder—\$111,000; also 50 internal and surface grinders of unspecified value

Nicco Machine Tool Company (Italy): 11 surface grinders—\$416,000

Toshiba Manufacturing Company: 16 surface grinders—value unspecified

1970—Yamada Koki Co., Ltd.: 10 internal grinders—\$833,000

Toyo Kogyo Co., Ltd.: 11 centerless internal grinders—\$152,000

Nippei Industrial Company: 16 double-disc surface grinders—\$1.1 million

Ickikawa Grinder Manufacturing Company: 12 surface grinders—\$1.4 million

Sanjo Machine Works: 3 surface grinders—\$277,000

1971—Ickikawa Grinder Manufacturing Co.: one surface grinder—\$56,000

The development of the automotive industry in the People's Republic of China should affect the market for imported grinding machinery to a greater extent than any other single factor. Rapidly rising requirements for trucks and buses should shift demand toward heavy-duty, high capacity precision equipment despite relatively high unit costs. Anticipated expansion of bearing manufacture and of shafts and other rotating machinery should also contribute to a substantial increase in demand for grinding machinery.

Imports over the 1974-78 period should include grinders of the following specific types:

- Vertical surface grinders with hydraulic reciprocating tables
- Horizontal spindle surface grinders
- Vertical spindle rotary surface grinders
- Surface grinders with table diameters of more than 1,500 mm.
- Double disc grinders for antifriction ball bearings
- Cam grinders for passenger cars and trucks
- Spline shaft grinders for construction machinery and machine tools
- Centerless grinding machines
- Cylindrical grinding machines for precision parts
- High-precision internal grinders for grinding diameters of more than 300 mm. and lengths of more than 200 mm.

Milling machines.—Universal milling machines are particularly important in the Chinese market because of their accuracy, versatility, and adaptability to mass-production techniques. Domestic manufacturers produce high-quality universal machines with table surfaces ranging up to 400 x 1,600 mm. and maximum spindle-axis distances up to 380 mm., but supply is short.

The more commonly used universal milling machine domestically produced is one with a working table surface dimension of 240 x 810 mm. and a maximum distance from spindle axis to table of 370 mm. This machine has six spindle speeds, a range of spindle speeds from 31 to 570 r.p.m. and six feeds in various directions. Other milling machines produced in China include vertical and horizontal types and copy millers. The shortage is particularly acute in the case of high-production machines and specialized equipment.

Recent major sales by Japanese firms indicate the kinds of milling machinery that China has imported:

1968—Enshu Ltd.: 20 milling machines—\$167,000

Hitachi Ltd.: six milling machines—\$97,000

1969—Hitachi Ltd.: 135 milling machines—\$1.7 million

Enshu Ltd.: 23 milling machines—\$189,000

Makino Milling Machine Co.: 11 milling machines—\$112,000

1970—Hitachi Ltd.: 75 milling machines—\$803,000

Enshu Ltd.: 10 milling machines—\$861,000

Ogawa Iron Works: nine vertical milling machines—\$830,000

Seiki Iron Works: 11 copy milling machines—\$1.7 million

Demand is expected to remain heavily dependent on imports in the 1974-78 period, especially for the following:

- Production-type milling machines
- Three-dimensional automatic profiling milling machines
- Vertical milling machines
- Worm milling machines
- Bed and planer milling machines

Other sales opportunities.—Additional MFE items with good sales prospects in the Chinese market should include horizontal boring machines, jig boring and milling machines, high-speed turret lathes, radial drilling machines, dies and precision tooling for machine tools, such as diamond-tipped tools and high-carbon steel tools. There is a limited market for two-axis numerically controlled (NC) equipment, some of which would probably be selected for use as prototypes for subsequent domestic manufacture.

The PRC's interest in NC and other advanced equipment arises from growing requirements for accuracy, uniformity, and standardization of parts rather than from the laborsaving opportunities they afford. Serial production of NC machine tools has begun on a limited basis; China exhibited six different types at a recent trade fair. The NC machines displayed were a four-spindle NC vertical milling machine, a table-type milling machine with a built-in minicomputer, a six-spindle NC turret drilling machine, a computer-operated NC vertical milling machine, an NC boring machine, and an NC vertical milling machine with a table size of 1,400 x 600 mm. with a hydraulic servomotor, an open-loop pulse motor, and a working accuracy of ± 0.5 mm. Most of this equipment, however, lacked the accuracy and high productivity of NC equipment produced in the United States, Japan, and other Western countries.

China purchased six NC machine tools and machining centers from leading Japanese manufac-

turers in 1972 and had previously purchased Japanese-made controls and electrohydraulic pulse motors. The Chinese are interested in numerical controls for retrofitting, but such equipment must be highly flexible to accommodate the variety of machinery used and the unique characteristics of many domestic machine designs. Digital readout and tracer systems also offer good sales potential because they provide accuracy and standardization at lower cost.

China produces both electrochemical machining (ECM) and electrical discharge machining (EDM) equipment, although it has imported some Japanese-made equipment of these types. Present import needs, however, appear limited to EDM for mold and die-making operations.

End-User Industries

China's industrial base has undergone enormous growth since 1950. Prior to that date the predominant form of economic activity had been subsistence-level agriculture. What little industry that had existed had been badly damaged during World War II. Although the Communist government has shifted economic policy a number of times—sometimes to further noneconomic objectives—the level of investment has generally been high.

Early policy sought to build modern, capital-intensive heavy industries such as coal, steel, power, cement, and engineering with Soviet and East European economic assistance. Consistent with this policy of "leaning to one side," China's foreign trade was predominantly with socialist partners. The cooling of Sino-Soviet relations with the withdrawal of Soviet aid in 1960 resulted in a shift in Chinese trade relations, with non-Communist nations accounting for more than 70% of China's trade by the mid-1960's.

Industrial growth proceeded rapidly following the Communist takeover in 1949, but the neglected agricultural sector stagnated, and economic plans were threatened by a lack of agricultural raw material for domestic consumption, export, and use in light industry.

In 1958, China adopted a radically different program termed the "Great Leap Forward." To stimulate agriculture, farming collectives were amalgamated into very large "People's Communes." The People's Communes were able to mobilize the rural population for large-scale land reclamation and flood control programs. In addition, the development of rural, small-scale, decentralized agriculture support industries was encouraged. Because the rural industrialization program paralleled the development of the modern, large-scale industrial sector in the urban areas, the policy was known as "Walking on Two Legs."

The "Great Leap Forward" encountered enor-

mous difficulties from multiple planning errors deriving from the dramatic institutional changes that were implemented, as well as from the adoption of such lofty economic goals as "Overtake Britain in 15 Years." The withdrawal of Soviet aid and technicians, plus the onset of several bad harvests, compounded the problems. The strains of poor coordination, indiscriminate choice of projects, and three crop failures had resulted by 1961 in a severe decline in both the agricultural and industrial sectors. Economic priorities were reordered. Agriculture received the greatest attention, as summed up in the slogan "Take Agriculture as the Foundation." The People's Commune was retained but substantially reduced in size, and many of the small-scale industrial activities started in 1958 were abandoned.

The broad outlines of economic policy have remained substantially unchanged since the early 1960's. Agriculture is still the economy's "Foundation," the People's Commune has grown increasingly strong as an institution, and small-scale agricultural support industries are vigorously encouraged (albeit more selective). In the period of the Fourth Five-Year Plan (1970-75), there appears to be renewed attention to large-scale modern industry; China now has its first massive program to import complete industrial plants and equipment since the mid-1950's. The best indications show continuation of an accelerated industrial push that will necessitate a substantial import component.

In the aggregate, the PRC's industrial output doubled between 1952 and 1957 and has increased significantly since that time. The current rate of growth is estimated at 8 to 10% annually, but is

much higher for chemical fertilizers, tractors, and other industries related to the agricultural sector (See table 3). Production of artificial fibers that can be substituted for cotton is also given priority. Although the total extent of China's investment in industry is unknown, the scale and order of priority are evident from purchases made during the 18-month period ending in mid-1974; complete plans or major plant components were imported from a variety of foreign suppliers at a cost of approximately \$1.9 billion. Facilities are mainly for the electric power, steel, fertilizer, petroleum, and petrochemical industries.

Output has also continued to rise in the steel, machinery, and petroleum industries, as well as in electrical power. In general, the small-scale rural industries have developed at a faster pace than the large ones. By 1972, small industry produced about one-half of total national production of cement and nitrogenous fertilizer and important quantities of other goods, including machine tools.

Because the PRC's investment resources are more limited than demand for products of industrial plants and equipment, machinery is run hard, frequently for multiple daily shifts, and workers are officially encouraged to devise technical innovations that can spur production. Productivity is limited in the basic industries by the age of equipment, much of which was installed during the 1950's. Another limiting factor is the lack of uniformity of parts production caused by the diversity of equipment used in the machine building industry and the dispersal of plants throughout the country for national defense regions.

Future trends will probably involve increased

Table 3.—People's Republic of China: Industrial production (estimated)

	1968	1969	1970	1971	1972	1973
<i>Basic Commodities</i>						
Electric power (billion kw.-hr.)	50	60	72	85	93	101
Coal (million MT ¹)	205	258	310	335	357	378
Crude oil (million MT)	15	20.3	28.5	36.7	43	53
Crude steel (million MT)	12	15	18	21	23	25
Aluminum (thousand MT)	180	195	220	230	260	280
Copper (thousand MT)	130	270	280	290	290	290
Cement (million MT)	11.3	13	13.3	13.8	14.8	15.4
<i>Manufactured Goods</i>						
Machine tools (thousand units)	40	45	50	55	60	65
Trucks (thousand units)	31	60	70	86	100	110
Tractors (thousand units)	16.4	19	24	28	31	37
Locomotives (units)	240	260	280	200	220	240
Freight cars (thousand units)	8.7	11	12	14	15	16
Merchant ships (thousand dead weight tons)	10	35	75	50	125	180
(units)	3	4	7	5	8	8
Paper, machine made (million MT)	1.7	1.8	2	2.2	2.3	2.4
Cotton cloth (billion linear meters)	4.8	6.5	7.5	7.5	7.5	7.5
Chemical fertilizer (million MT)	8.2	11.3	14.0	16.9	19.9	24.8

¹ Metric tons.

Source. U.S. Government.

attention to the modern large-scale production sector, especially heavy industries, such as steel and power generation, whose expansion is essential to other industrial growth. Rising needs for foreign exchange to pay for the capital equipment imports could cause higher priorities to be given industries producing commodities for export, particularly petroleum. Whatever the adjustments, heavy emphasis on agriculture will probably continue, as will the relatively large degree of local control over production.

First Ministry of the Machine Building Industry.—The most important central government entity concerned with the production and allocation of MFE in China is the First Ministry of the Machine Building Industry, which has authority over most end-users and producers of machine tools and metalworking equipment. The Ministry comprises 10 bureaus that deal functionally as follows: first, General Machinery and Light Industrial Machines; second, Machine Tools and Other Tools; third, Metallurgical and Mining Industry Equipment; fourth, Prime Movers and Diesel Engines; fifth, Locomotives and Other Railway Equipment; sixth, Automobiles, Bearings and Agricultural Machinery; seventh, Instruments and Meters; eighth, Electrical Machinery; ninth, Shipbuilding; and tenth, Radios and Electronics Equipment.

Seven additional Ministries of the Machine Building Industry are concerned with other end-user sectors, including atomic energy, conventional weapons, electronics and telecommunications equipment, heavy weapons and artillery, naval equipment and shipbuilding, aircraft and missiles, and agricultural machinery and implements. Additional MFE end-users under the control of other governmental authorities are the textile industry (Manufacturing Bureau of Textile Machinery of the Ministry of the Textile Industry); the chemical industry (Equipment Manufacturing Department of the Ministry of the Chemical Industry); construction and roadbuilding equipment (Ministry of Construction); railroad workshops (Control Bureau of Locomotives and Vehicles Factories of the Ministry of Communications); and consumer appliances such as sewing machines and bicycles (Ministry of Light Industry).

The following paragraphs discuss industries identified as the principal users of MFE in China, users whose requirements for imported equipment are likely to increase.

Motor vehicle industry.—Truck production, which began in China in 1956, expanded steadily to a 1973 level of 110,000 units. Although several passenger cars and a variety of three-wheeled vehicles and special-purpose vehicles are also manufactured, trucks are the principal product.

Almost two-thirds of total truck production takes place in a fully integrated complex, the Ch'ang-

ch'un No. 1 Motor Vehicle Plant, constructed with Soviet aid and equipped with Soviet machinery in the mid-1950's. The Ch'ang-ch'un facility produces the CA-10 "Liberation" model truck, a 4-ton unit based on the Zil-150 truck that, in turn, was a copy of a U.S. vehicle sent to the U.S.S.R. during World War II. The "Liberation" has a 6-cylinder, 90-horsepower engine, and maximum speed of about 40 miles per hour. Other major truck manufacturing plants are located at Peking, Nanking, and Wuhan. Most of the remaining automotive production facilities are small-scale, nonintegrated plants converted from repair shops or parts producers. In general, they obtain engines and parts from a variety of suppliers.

Historically, the PRC has attached considerable importance to the expansion of its vehicle manufacturing capacity and has recently become interested in upgrading the level of technology as well. The Soviet machine tools installed in the Ch'ang-ch'un and Nanking plants are more than 20 years old, while the "Liberation" truck itself has a number of limitations (such as high gasoline consumption, low payload, and high maintenance time) that may soon prompt its replacement.

Recent investment in machine tools for the motor vehicle industry has been substantial. Large purchases have included stamping and forging presses, and other equipment of Italian, West German, British and Japanese origin, in addition to the gear producing equipment ordered from the United States. Future import trends are indicated by recent inquiries directed to foreign suppliers concerning machine tools for the production of truck parts such as flywheels, brake drums, and differential housings.

The lack of standardization in the production of parts in China has adversely affected the growth of the automotive industry. Many plants rely on nonautomated, nonstandardized systems lacking in high productivity and incorporating noninterchangeable products. The overall level of technology employed is probably similar to that in use in the United States prior to World War II.

Import demand is therefore likely to center on equipment that will improve productivity and precision. The most salable items should include:

- Gear shapers
- Gear cutting machines
- Precision grinding machines

Power generating equipment.—China has three large thermal generating plant equipment manufacturing complexes located at Harbin, Peking and Shanghai. Each produces a complete range of plant equipment: boilers, turbines, and generators. The Harbin complex, built with Soviet aid, uses Russian equipment and techniques to manufacture large hydroelectric generator sets. The Shanghai plant contains the most modern equipment and is

engaged in the development of larger turbo-generators. Other smaller plants produce specific components; for example, a plant located at Wuhan manufactures boilers. The equipment produced domestically has played an important role in enabling China to double the installed capacity of generating equipment from an estimated 14 million kilowatts (kw.) in 1965 to 29 million kw. in 1973.

The largest thermal turbogenerator in regular production is rated at 125,000 kw. Although the PRC has announced that a prototype 300,000-kw. unit is in operation, and also has claimed production of 225,000-kw. hydroelectric generators at Harbin, the serial production of the larger capacity equipment will require a complete upgrading of equipment and engineering technology. The major tasks facing the industry will include the design of boilers and turbines with higher steam pressure and temperature parameters, the production of larger rotors and shafts, improved metallurgy, improvements of precision in the machining of parts, and the development of modern testing and measurement techniques.

Production of diesel engines for diesel-electric power generation and other stationary use is centered in Wuhsi in eastern China, where more than five diesel engine and parts factories are located. Additional (several dozen) plants manufacture diesel engines at Shanghai, Tientsin, Nanchang, Wuhan, and Tsinan. Most of the engines produced are low-power units; total production of diesel engines in Wuhsi between 1942 and 1962 was about 1 million horsepower. China still requires equipment for the production of diesel engines of 1,200 horsepower and above.

As the expansion of the power generating industry takes place, import sales opportunities involving large-dimension and high-precision equipment may be expected. The following specific items have good sales potential:

- NC or tracer controlled machine tools to produce turbine blades
- Balancing equipment for large rotating machinery
- Large forging machinery for rotors and shafts
- Large vertical boring mills
- Large planer milling machines
- Large lathes
- Large surface grinders
- Large cylindrical grinders
- High-speed radial drilling machines

The metallurgical equipment industry.—China has some eight principal metallurgical equipment plants and a number of small machine shops engaged in the production of nonferrous metallurgical equipment, coke ovens, blast and open hearth furnaces, rolling mills, forging presses, and related steelmaking equipment. Total production has been able to support a 2- to 3-million-ton annual expansion in the output of the steel industry to a 1973 level of about 25 million metric tons, but it is believed to be

inadequate for the more rapid rate of expansion now planned for the domestic metals industry. In addition to lack of capacity, problems of inefficiency and obsolescence are developing, since most of China's existing metallurgical equipment manufacturing machinery was designed and installed by the Soviets during the mid-1950's. The major plants and their products are as follows:

- Fu-la-erh-chi Heavy Machinery Plant (Heiliungkiang Province)—blast furnace equipment and components, a complete range of steel smelting and rolling equipment; large blooming mills, structural mills, burmills and seamless tube mills.
- Louang Mining Machinery Plant—complete range of equipment for iron and steel smelting and rolling; mining machinery.
- Tai-yuan Heavy Machinery Plant—plate rolling mills, hydraulic forging presses; large forging hammers.
- Shenyang Heavy Machine Plant—entire range of metallurgical equipment; 2,500-ton hydraulic presses capable of forging 45-ton steel ingots, and other heavy machinery.
- Ching-yeh Machinery Plant—blooming mills
- Shao-kuan Heavy Machinery Plant—equipment for medium-size iron and steel plants, rolling and coking equipment; large cranes
- Wangkiang Machinery Plant (Ch'ung-ch'ing)—rolling mill equipment, seamless tube mill equipment

China is satisfying some of its immediate requirements for metallurgical equipment through the importation of foreign-built machinery, including entire plants such as the Wuhan hot and cold sheet and strip mill complex recently purchased from Japan and Germany and scheduled for installation in 1977. Imports of heavy-duty machine tools to upgrade and further expand domestic metallurgical equipment production are likely to become increasingly important. The machine tools with the greatest potential for this industry are as follows:

- Large turret lathes
- Milling machines
- Boring and milling machines
- Planer milling machines

The machine tool industry.—Investment in machine tool plant and equipment in China has been substantial in recent years, a trend which should continue in view of the rising requirements of its end-users. At present, the industry's principal products are general-purpose machine tools such as lathes; milling, grinding, and boring machines; drill presses; and gear making machines. Although the production of such machines has developed sufficiently to enable China to decrease imports of general-purpose machine tools that previously constituted a large portion of total MFE imports, capacity is still lacking for the production of large-size and high-precision equipment. Production of special-purpose tools is limited.

Over the 1974-78 period, the Chinese will require precision machine tools for the manufacture

of machine tools with improved accuracy and performance. In addition, demand should strengthen for key components, such as bearings, presently being imported. The import of machine tools and components for use as prototypes will rise. The following equipment items have particularly good potential for U.S. suppliers:

- Heat treatment equipment
- Copy milling machines
- Precision measuring instruments

Agricultural machinery industry.—China has assigned a high priority to agricultural mechanization and is emphasizing the production of tractors, diesel engines, and pumps. Other powered agricultural machines built include threshers, sprayers, drainage and irrigation equipment, combines, plows, harrows, seeders, cultivators, and harvesters.

Tractor production, which in 1973 amounted to 37,000 units, is concentrated in four major plants located at Loyang, Tientsin, Anshan (Red Flag), and Hangchou. The Loyang plant, with an estimated capacity of 15,000 units, manufactures the "Tung-fang-hung" model, a crawler-type, 54-horsepower (hp.) tractor. The Tientsin plant ranks second, with an estimated capacity of 5,000 units annually, for 45-hp. tractors. Both plants were constructed with Soviet aid between 1954 and 1956. The plants at Anshan and Hangchou, respectively, produce an 80-hp. all-purpose tractor.

More than 1,000 small rural plants, equipped with domestically produced machine tools, account for most of the remaining production of agricultural machinery. Some mass production, however, may take place at the provincial level (e.g., such larger items as pumps and combines), but the level of technology is limited.

Because of the high priority accorded the industry, imports of production machinery probably will become increasingly important but are likely to be limited primarily to special-purpose machine tools suitable for use in the manufacture of tractors and diesel engines. Equipment with the best sales potential should include the following:

- Gear shapers
- Gear hobbing machines
- Gear cutting machines
- Grinding machines
- Boring and milling machines

Domestic Manufacture of Metalworking and Finishing Equipment

Reflecting the objective of attaining maximum self-sufficiency, machine tool production in China should continue to expand at a pace at least equal to the average annual rate of 10% recorded between 1968 and 1972, when total output grew from an estimated 40,000 to 60,000 units. Both increasing magnitude and sophistication of demand are

expected as a result of the development of the priority end-user industries.

While the capability of the Chinese machine tool industry in producing a wide range of MFE has been reflected in declining imports, imports will continue to be important in fulfilling requirements in the foreseeable future. Chinese machine tool builders still concentrate on the production of general-purpose machine tools, although small numbers of special-purpose tools are produced and an NC production capability is being developed.

Among the major manufacturers is the Shanghai No. 1 Machine Tool plant, a converted agricultural machinery plant built in 1946 that has become the country's largest producer of grinders. The plant's capacity is probably in excess of 1,800 units annually. The plant produces cylindrical and universal grinders, precision gear grinders, and thread and roll grinders. The plant also manufactures some general-purpose metal cutting machine tools. Although some original capital equipment of U.S. origin remains in use, the plant also has modern equipment from Czechoslovakia, Hungary, the U.S.S.R. and Switzerland.

Other important producers include the Shanghai Heavy Machine Tool Plant, reportedly China's largest machine tool plant, which produces heavy-duty and precision machine tools, including vertical boring machines and forging presses. The Kunming Machine Tool Plant manufactures precision machine tools such as optical jig boring machines, horizontal boring machines, copy milling machines, universal milling machines, and some special-purpose machine tools for production of tractors and diesel engine parts. The Wuhan Heavy Machine Tool Plant, built with Soviet aid, produces large equipment such as planers with work tables up to 8 meters (m.), threading lathes, milling machines, and large forging hammers. According to one report, the plant produced a 9-m. vertical lathe capable of handling an 80-ton, 6.3-m. workpiece to a tolerance of less than .03 mm. The Soviet-built Harbin Measuring and Cutting Tool Plant produces precision instruments such as gage blocks, universal measuring instruments, optical comparators, induction comparators, air gaging instruments, and vertical length meters. The Chengtu Measuring and Cutting Tool Plant, a smaller facility based on the same design as the Harbin Plant, produces 49 kinds of cutting tools. The Shenyang No. 1 Machine Tool Plant produces medium-size lathes, including special lathes for turning camshafts for agricultural engines and for finishing pipes of 500-mm. diameter; the plant was expanded in 1953 with Soviet aid and has an annual production capacity of 3,500 units. The Nanking Machine Tool Plant produces turret lathes, including high-tolerance equipment; annual production is 1,500 units. The Chenchou Abrasive Material Plant, of East German

design, manufactures grinding machines and grinding wheels with diameters from 2 cm. up to 2 m.

The Tsitsihar No. 1 Machine Tool Plant, built in 1950 with Soviet aid, turns out semiautomatic shaping machines, universal milling machines, heavy shears, and engine lathes. The Wu-hsi Machine Tool Plant produces centerless and bearing grinders. The Shenyang No. 2 Machine Tool Plant, which was built in the 1940s by the Japanese, produces radial and upright drilling machines, boring machines, and other special-purpose machines. The Nanking Machine Tool Plant, prior to 1949 a Sino-U.S. joint venture, produces boring machines. The Nanking Second Machine Tool Plant, an amalgamation of several small shops and plants, manufactures gear hobbing machines; shapers, including gear shaping machines; and gear honing machines. The Tientsin Machine Tool Plant, manufactures hot rolling machines for high production of slotted twist drills; the Tsinan Machine Tool Plant (Shantung) turns out double housing planers. The Peking No. 1 Machine Tool Plant specializes in producing machine tools as well as general-purpose equipment. Its 1966 production of large-scale, heavy-duty vertical and horizontal lathes was 2,400 units. The plant produces a heavy-duty planer that is 3 m. by 6 m. by 18 m. The Peking No. 2 Machine Tool Plant was developed from a small shop producing only shaping machines; its current products include jig boring machines, universal grinders, piston ring grinders, and crankshaft turning machines.

Most of the important plants were constructed and equipped between 1950 and 1960 with Soviet and East European aid, but they have continued to add modern machinery from a variety of foreign suppliers and to modify the original equipment to achieve improved performance. After the withdrawal of Soviet aid, the Chinese continued to develop their machine tool industry with internal effort and selected equipment imports. The Chinese have imported considerable equipment for use as prototypes for domestic manufacture and, as a result, present designs incorporate some West European technology. They do not subscribe to patent and copyright agreements. Although joint ventures and licensing have not been employed by the Chinese up to the present, China is willing to make direct purchases of technology on a flat fee basis when industrial priorities are high or special complexity precludes reverse engineering.

The Central Design and Test Institute and The Lathe Study Bureau play an important role in the development and testing of new machine tools. Chinese machine tool builders reportedly have experienced problems with tool design, precision measurement and standardization, and the production of the required special steels for tools. The Chinese appear to have difficulty in attaining high

precision tolerances in their general purpose machine tools and also in producing large capacity machine tools such as are required in the manufacture of big turbines and power generators, the ship-building industry, and other heavy industry sectors. Trade sources rate the level of Chinese machine tool building technology as comparable to the state-of-the-art in Japan in the late 1950's.

MFE exports by China should become more important as production improves and expands, although satisfaction of domestic demand will remain the principal focus of activity for some time to come. At present, lathes and other turning machines are the largest export items, but limited quantities of drilling machines and other general-purpose metal cutting equipment are also exported. These sales are directed primarily to Cuba, North Korea, North Vietnam, and Albania, as well as to lesser developed countries in Asia and Africa.

Trade Regulations and Practices

Foreign trade in China is a state monopoly conducted by the Ministry of Foreign Trade on behalf of all segments of the economy, including the various industry ministries and other governmental entities, and on the basis of priorities determined in advance through the central planning process. Whatever customs duties are assessed appear to be a matter of internal accounting only.

A network of eight Foreign Trade Organizations (FTOs), designated to handle trade in specific commodities under the authority of the Ministry of Foreign Trade, comprises only those organizations with which foreign suppliers may conduct business. Direct contact with the production ministries or individual end-users is rarely possible.

Business may be expedited if correspondence is written in Chinese, or if Chinese translations accompany the English originals, because the recent expansion of trade with foreign suppliers has strained the PRC's capability for processing foreign-language materials. All translations should employ the simplified characters currently in use in the PRC.

After the initial contact, business is normally carried out in Peking with Machimpex by attendance at the semiannual Chinese Export Commodities Fair held in Kwangchow (Canton) in May and October. Invitations are required in order to obtain a visa to visit China. Business development assistance may be obtained from the National Council for U.S.-China Trade, Suite 513, 1100 17th Street, N.W., Washington, D.C. 20036, and from the Bureau of East-West Trade, Division of PRC Affairs, U.S. Department of Commerce, Washington, D.C. 20230.

MFE, particularly sophisticated machine tools, may be subject to U.S. export controls. Firms contemplating sales of MFE to the PRC are encouraged

to seek guidance at a preliminary stage of any transaction from the Exporter's Service, Office of Export Control, Bureau of East-West Trade.

In general, the Chinese prefer to negotiate purchases directly with the manufacturer rather than deal with agents. Such negotiations are frequently protracted. Technical factors and price have been the most important criteria in the selection process, but financing arrangements may assume some importance in the future. The PRC has paid for most industrial imports in cash under irrevocable letters of credit. However, the Chinese have begun utilizing medium-term (5-year) credits, as was the case with the purchase of several complete fertilizer plants in 1973-74.

Chinese end-users customarily install imported equipment and do not require service, maintenance, or other assistance from the seller. In cases of very complex or highly specialized equipment, however, the Chinese may make special arrangements with the supplier to furnish personnel for training in the United States or China and for startup.

Additional information on trade practices and procedures to be followed in exporting to China is contained in a U.S. Department of Commerce Overseas Business Report, "Trading with the People's Republic of China," May 1973 (OBR 73-16). "Basic Data on the Economy of the People's Republic of China", June 1974 (OBR 74-1) may also be of interest to businessmen considering trading with the PRC.

Technical Requirements

The electricity supply in China is both single phase 20 volt a.c., 50 hertz, and 3-phase 370 volt a.c., 50 hertz.

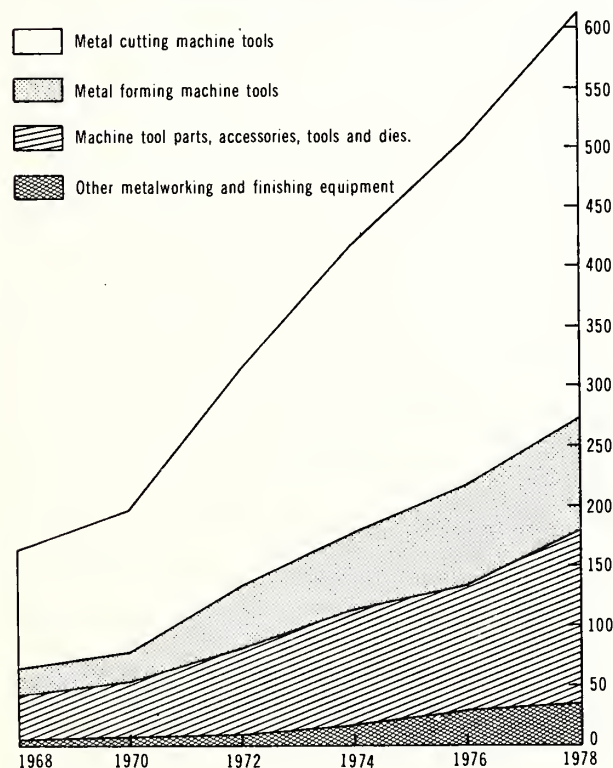
There are no standard labeling or marketing requirements. When purchasing, the Chinese usually specify such requirements in detail.

Although the Chinese generally adhere to the metric system, information concerning other technical standards is not available. It is known that a standard exists for surface finish of metal parts and it is likely that other standards exist.

Poland

The Polish market for metalworking and finishing equipment will continue to expand as a result of current economic policies which emphasize the development of export-oriented heavy industries. Polish economic plans call for the establishment of a number of new plants, with a heavy reliance on advanced equipment and technology of foreign origin. Increasing specialization and improvement of product quality within existing industrial enterprises is also projected.

Poland: Consumption of metalworking and finishing equipment, 1968-1978, alternate years.
(in millions of U.S. dollars)



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Polish statistics and trade source estimates.

Most of the planned expansion relates to industries that are substantial users of metalworking and finishing equipment (MFE), such as motor vehicles, electrical and power generating equipment, construction machinery, machine tools, agriculture equipment and shipbuilding industries. Poland normally expends about 50% of total investment funds on foreign-made goods, and the proportion is significantly higher in industries that utilize large quantities of MFE. Capital equipment for these priority ventures will be supplied substantially by imports from nonsocialist countries.

Poland, which was an agricultural country at the end of World War II, has emphasized industrialization under successive development plans that provided accelerating levels of capital investment. Capital investment increased between 1968 and 1972 at an average annual rate of 13 to 14%, growing from \$4.5 to \$7.5 billion. During the same period the gross national product (GNP) grew by 9.3% annually from \$18.4 to \$26.3 billion, while a growth rate of 9.5% was recorded for industrial production, which grew from \$16.2 to \$23.3 billion. A somewhat more even growth pattern, with a slightly decelerated investment rate and slightly increased GNP and industrial production rates, is forecast between 1974 and 1978, as more and more factories start up and consumer goods receive greater attention.

According to trade estimates, the market for metalworking and finishing equipment will exceed \$600 million in 1978, reflecting an average annual growth rate of more than 10% from the estimated 1974 level of \$418 million (see table 1). A limiting influence on the size of the market for MFE between

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	Zloty/US\$1
Foreign trade	
1968-70	4.0
1972	3.676
1974-78	3.32
Domestic circulating Zloty	
1968-78	40.0

1974 and 1978 will be the extent to which Poland can generate export earnings or arrange credit to pay for the capital imports essential to further industrial expansion.

Although the average age of machine tools in use in Poland is less than 15 years, most machines are low-capacity standard pieces purchased for factories that started up prior to 1965 and are now facing new pressures to expand capacity and modernize production. An equipment replacement market is thus developing within existing industries. The problem of technological obsolescence, which has already affected demand for special-purpose machine tools, may soon apply to general purpose equipment as well.

The market for new metal cutting machine tools will grow substantially as new plants are established

and specialization increases. Total consumption is expected to increase at an average annual rate of about 9.6% during the 1974-78 period, going from \$240 million to \$341 million. This represents a slight decrease over the growth in the market recorded in the 1972-74 period.

Poland is likely to remain about 40% dependent on imports for its supply.

Trade sources project expansion of the metal forming machine tool market at an average annual rate of about 10% over the 1974-78 period, reaching \$93 million in the latter year. Purchases increased at a somewhat faster rate between 1972 and 1974, growing from \$49 to \$65 million. Imports supplied about 3% of the market for this equipment in the 1972-74 period and should continue to do so through 1978.

Increased purchases of machinery in line with industrial expansion plans should boost the market for tooling and accessories to \$130 million in 1978, about 45% above the \$89 million estimated for 1974. Imports are expected in 1978 to supply about 50% of total purchases, compared with 43% in 1972.

The small market for metal finishing equipment is expected to grow rapidly over the next 4 years. The projection is for a \$20-million market in 1978, more than double the \$9 million recorded in 1972. Annual expansion averaged 24% between 1972 and

Table 1.—Poland: Consumption ¹ of metalworking and finishing equipment, 1968, 1972, 1974 and 1978
(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories, tools and dies	Metal finishing equipment	Other	Total
<i>1968</i>						
Production	73	17	36	2	2	130
Imports	64	9	8	1	—	82
Exports	37	3	7	—	—	47
Consumption	100	23	37	3	2	165
<i>1972</i>						
Production	130	33	61	3	6	233
Imports	109	21	22	3	3	158
Exports	57	5	13	1	1	77
Consumption	182	49	70	5	8	314
<i>1974</i>						
Production	155	43	76	5	9	288
Imports	160	30	38	5	8	241
Exports	75	8	25	1	2	111
Consumption	240	65	89	9	15	418
<i>1978</i>						
Production	225	65	110	10	19	429
Imports	226	43	70	13	15	367
Exports	110	15	50	3	5	183
Consumption	341	93	130	20	29	613

¹ Consumption equals production plus imports minus exports.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Polish trade source estimates.

1974. Imports are expected to be increasingly important and should supply more than 50% of all purchases in 1978.

Although Poland is moving toward specialization in production and some integration with the world metalworking equipment market, Polish economic policy requires that internal demand be met by domestic manufacture whenever possible. Most imports are restricted to equipment items not manufactured in Poland, or to segments of complete factory or production line installations for priority industries.

Because of the emphasis on advanced technology in new industrial ventures, capital goods for these projects will be supplied in large measure by imports from Western suppliers. Total MFE imports are predicted to increase in 1978 to about \$367 million, or 60% of consumption, in comparison with the \$158 million or 50% of the market recorded in 1972 (see Appendix).

Poland purchased \$1.3 million, or 0.8%, of its imports of metalworking and finishing equipment from American manufacturers in 1972 (see table 2). However, the United States' share is expected to reach about 7.5%, or \$22 million, in 1976, as a result of greater demand for the sophisticated and specialized equipment in which U.S. producers have a lead. Germany has led Western suppliers with a 1972 market share of 13%, followed by Italy with 6.6% and the United Kingdom with 3.9%.

Nonsocialist suppliers are expected to maintain or to slightly improve their individual market shares, bringing aggregate imports from Western suppliers to about 35% of total imports in 1976. The United States should supplant Italy as the second largest source of Polish MFE imports. Poland is expected to increase imports from Japan because of the improvements being made to facilitate through container traffic on the Trans-Siberian Railroad.

Poland will continue to import the bulk of its metalworking equipment from Council for Mutual Economic Assistance (CEMA)¹ countries. Official policy is directed toward the conservation of scarce hard-currency reserves and the promotion of a joint industrial specialization program. However, imports from CEMA countries will be inhibited by supply shortages and by the concentration on basic machine tools by CEMA producers.

In dealing with nonsocialist countries, Poland shops for price, concessional financing, and whenever possible, "cooperation" agreements under which a prospective foreign supplier generally agrees to furnish the technology and, in turn, purchase some portion of the output.

U.S. exporters of metalworking equipment would

be well advised to promote their machinery as a part of a complete package, or as technologically advanced special-purpose or precision equipment. The complete installation specifications are usually "product oriented"; that is, they describe type and quantity of desired output, e.g., pistons, axles, or other automotive parts, rather than machinery. In such cases, supply of various machines and tools may be negotiable, depending on price and other factors to a greater extent than on technology. Specific machine demands, on the other hand, usually require equipment of the latest technology.

Sales Opportunities

The industrial development programs now underway in Poland are giving rise to sharp increases in demand for metalworking and finishing equipment. A market research study recently conducted in Poland for the U.S. Department of Commerce Office of International Marketing, has identified those items that have the best potential for U.S. exporters; they are discussed in the following paragraphs.

Gear cutting machines.—Due to plans for future plant development in the automotive and machine-building industries, Poland's consumption of gear cutting machines will probably rise in 1978 to \$35 million, more than double the \$15.2 million consumed in 1972. Imports totaled approximately \$13.5 million in 1972 and are predicted to rise to about \$30 million by 1978, when an estimated 800 units are expected to be imported. As much as \$9 to \$12 million of this should be imported from nonsocialist suppliers because of continuing production bottlenecks among Communist countries and because domestic production will remain limited. The technological superiority of U.S. manufacturers will be a decided advantage; in 1972, imports from the United States were over \$1 million. Gleason Works has been the major U.S. supplier.

Most Western competition for the Polish market has come from Italy (about \$816,000 in sales of gear making equipment in 1972), and Germany (about \$272,000 in 1972). The leading Italian supplier was Ceruti, and the leading German suppliers were Leibherr Verzahntechnik, Pfauter, and Roth & Muller. Sykes of the United Kingdom, and Oerlikon & Buehrle of Switzerland were also active in the market.

The planned new factory installations and rising general demand will require substantial imports of the following kinds of equipment:

- Bevel gear generating machines
- Gear hobbing machines for bevel gears
- Bevel gear grinding machines
- Gear lapping and polishing machines
- Gearing grinding machines
- Gear hardening machines

¹ Members of CEMA include the U.S.S.R., Poland, Czechoslovakia, East Germany, Hungary, Bulgaria and Rumania.

Table 2.—Poland: Imports of metalworking and finishing equipment, from selected countries, 1972
(in thousands of U.S. dollars)

	U.S.	Germany	U.K.	Japan	Italy	Other ¹	Total imports
Metal cutting machine tools	1,224	10,064	2,720	816	7,888	85,717	108,429
Metal forming machine tools	14	5,168	1,088	—	1,088	13,883	21,241
Subtotal metalworking equipment	1,238	15,232	3,808	816	8,976	99,600	129,670
Machine tool parts accessories, tools, and dies.....	54	4,515	1,415	—	980	15,447	22,411
Metal finishing equipment	27	272	136	—	408	1,877	2,270
Other	—	408	707	—	68	1,728	2,911
Total	1,319	20,427	6,066	816	10,432	118,652	157,712

¹ Mostly from U.S.S.R. and other CEMA (Council for Mutual Economic Assistance) countries.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Polish statistics and trade source estimates.

- Gear honing machines
- Gear checking machines

Grinding machines.—The aggregate market for grinding, polishing, and honing machinery is expected to attain a level of about \$95 million in 1978, as against \$40.8 million in 1972. Imports are expected to rise from the \$27.2 million recorded in 1972 to almost \$60 million in 1978, supplying about two-thirds of domestic requirements.

In Poland, as is the case in other industrialized countries, 25 to 30% of future cutting machinery installations should be grinding machines. However, Poland can produce only limited quantities of high-precision grinding equipment; the highest working speed yet recorded for domestically produced machinery is 40 m/sec. Imports will probably comprise 2,500-3,000 units in 1978, in contrast to the 1,500 estimated in 1972. The United States could furnish as much as 20% of this total import market, since Polish industry spokesmen have expressed a preference for U.S.-manufactured equipment to meet requirements for high-speed ball bearing production or special automotive grinding.

Poland imports the majority of its grinding machines from the U.S.S.R., East Germany, and Czechoslovakia. The major nonsocialist suppliers of grinding equipment in 1972 were West Germany, from which Poland purchased \$3.4 million; Italy, which supplied \$2.7 million; and the United Kingdom, from which Poland purchased \$1.4 million. The U.S. firms of Cincinnati Milacron, and Warner and Swazey are active in the market.

Leading European shippers include Deckel, ACME-Neu-Isenburg, Hermann Klob Maschinenfabrik, and Waldrich-Coburg (Germany); Alfred Herbert, Matrix-Coventry, and Hayes Engineers (Leeds) (United Kingdom); Agathon, and Kellenberger (Switzerland); and Johansson Grinding Machines (Sweden).

Although Poland's major imports from nonsocialist suppliers will probably be such items as crankshaft and camshaft grinding machines, external and internal cylindrical grinding machines, and center-

less grinding machines, the country is interested in a wide range of additional machinery. Other U.S. sales opportunities can best be developed when the equipment is incorporated as part of a turn-key installation, or offers some special technical advantage. There is a heavy demand for the following machinery items:

- External cylindrical grind machines
- Centerless grinding machines
- Internal grinding machines
- Surface grinding machines with horizontal spindle and reciprocating table
- Horizontal surface grinding machines
- Axle journal grinding machines
- Thread grinding machines
- Piston ring grinding machines
- Ball grinding and lapping machines
- Bearing race grinders
- Crankshaft grinding machines
- Cam and camshaft grinding machines
- Precision tool room grinding machines
- Broach profile grinders
- Valve grinding machines
- Cutter grinding machines
- Twist drill grinding machines
- Hob grinding machines
- Spline shaft grinding machines
- Worm grinding machines

Presses.—Poland's consumption of presses (including hydraulic presses) should increase by an estimated 14% per year from the \$27.6 million recorded in 1972 to about \$60 million in 1978; imports are expected to rise at about the same rate to a level of approximately \$27 million. Domestic production of all types of presses amounts to 800-1,000 units.

Primary import items are:

- Press brakes
- Blanking presses
- Double column presses
- Drawing presses
- Four-column presses

In 1972, about 400 presses were imported, of which 80-100 were of the hydraulic type. An import level of 800 units of all types is projected for 1978, with

about 40% coming from Western suppliers. New opportunities are closely related to the expansion of the Polish automobile industry, which would prefer to equip its new plants with U.S.-manufactured presses, provided the prices are competitive with those of other nonsocialist suppliers. The U.S. manufacturers best known in Poland are Vernon, Danly and Bliss.

Germany has been the major supplier from Western Europe, and in 1972 Poland imported a total of \$3.4 million worth of presses from German firms such as Schuler-Pressen, Schenk, Eumeco, and Hasenclever. In the same year, imports from Italy amounted to \$952,000 and from the United Kingdom they totaled \$16,000. Other nonsocialist suppliers frequently include Voest-Vereinigte Österreichische Eisen-und Stahlwerke of Austria and Ateliers et Chantiers de Bretagne of France.

The following equipment items will offer the best sales opportunities over the next 4 years:

- Straight-sided presses
- Wide frame hydraulic drawing presses
- Four-column presses
- Press brakes
- Automatic blanking presses
- Multiple action presses
- Transfer feed presses

Automatic turret lathes.—Poland's industrial expansion program should enable U.S. manufacturers to expand sales of lathes. The total Polish market for turret and special lathes, both automatic and semiautomatic, should amount to about \$71 million in 1978, representing a projected average annual increase of 12.6% above the estimated 1972 total of \$34 million. Imports in 1978 are forecast to amount to about \$44 million (2,300-2,500 units), of which about 15% should be supplied by nonsocialist sources. Purchases from Western countries are limited primarily to high-performance, high-precision machinery, since Poland and other Socialist countries produce automatic turret lathes. Increasing requirements for precision bearings should be an important stimulus to the market. Total imports in 1972 amounted to \$18.4 million, representing an estimated 1,200 units. Domestic production is placed at 2,500 to 3,000 units annually.

U.S. lathes from ACME, Rockwell, and Monarch are currently being used in Poland, which imported a total of \$136,000 of U.S. equipment in this category in 1972. Poland's major suppliers in 1972 were West Germany (imports of \$2 million), followed by Italy, the United Kingdom, and Japan. The major European firms represented were Pittler Maschinentabrik, Gildemeister, Max Muller, and Karl Huller (Germany); Oerlikon-Buehrle, and Schaublin (Switzerland); Herbert Machine Tools (United Kingdom); and AMTEC France (France).

Equipment items offering the best sales potential over the next 4 years include the following:

- Turret lathes with hexagonal type turrets
- Multispindle bar or chucking automatic turning machines
- Automatic turning machines

Milling machines.—The short supply of high-performance milling machines throughout Eastern Europe should give U.S. suppliers increased opportunities to sell in Poland over the next 4 years. Industrial growth is expected to boost imports between 1972 and 1978 from about 1,500 units valued at \$18.9 million to about 2,500 units worth some \$38 million. As in the past, most of the equipment imported will come from the U.S.S.R., East Germany, Czechoslovakia, and other socialist sources; in 1978, however, Western sources should account for about 20% of the milling machines imported. Domestic production is 3,000 to 4,000 units.

Poland's increasing interest in imports from the United States and other nonsocialist suppliers is due to the higher precision, efficiency, and versatility of the Western products. Germany and Italy have been Poland's leading Western suppliers of milling machines, with recorded imports of \$1.5 million and \$1.1 million, respectively, in 1972. The German firms Fr. Deckel, Schiess, Fritz Werner, and Waldrich-Coburg were particularly active. Other well-known European suppliers included Hayes Engineers (Leeds, (United Kingdom)), Schaublin (Switzerland), and Noord Nederlandsche Machinefabriek (Netherlands)). Although the United States has not recorded exports of milling machines to Poland in recent years, machinery from manufacturers such as Ex-Cell-O, Kearney & Trecker, Cincinnati Milacron, and Pratt & Whitney has earned a good reputation in Poland.

Poland's primary demands for milling machinery will include the following:

- Copy milling machines
- Turret milling machines
- Crankshaft milling machines
- Twist drill milling machines
- Horizontal milling machines, knee type
- Universal milling machines, knee type
- Vertical milling machines, knee type
- Bed and planer type milling machines
- Universal tool milling machines
- Engraving machines, photograph type
- Slot and keyway milling machines
- Spline shaft milling machines
- Worm milling machines

Other sales opportunities.—Poland will also require a wide range of equipment in addition to the categories discussed above. Other items expected to be in heavy demand are polishing, lapping, honing, and finishing machines; wire stranding machines for the cable and electrical industries; wire drawing machines; drilling machines, particularly way type

drilling and boring machines, and heavy duty radial drilling machines; electrical discharge machining equipment; metal cleaning equipment, including disintegrating and deburring equipment; extrusion and die casting equipment; parts and accessories for metalworking equipment such as magnetic chucks, air chucks, copying attachments, and tool holders; tools such as diamond tools, carbide-tipped tools, die sets for presses, gear hobbing tools and gear shaving cutters; and gear checking equipment.

The Polish market for numerically controlled (NC) machines is small, and the domestic industry produces a limited quantity of NC equipment utilizing the Numeroblock and Fotoster systems. They are experimenting with adapting these systems to the Polish Odra computer family. Demand for numerically controlled machine tools is likely to be confined to the machine tool and electrical machinery industries over the next 4 years. A small market for digital readouts and electrochemical machinery should develop during the period through 1978.

End-User Industries

Poland has a centrally planned economy in which successive 5-year plans drawn up by the State Planning Commission of the Council of Ministers set goals, assign priorities, allocate investment, and regulate expenditures. Individual industrial enterprises may be state owned or cooperatively owned, but in either case they are closely governed by the official plan and supervised by the responsible ministry. Poland is currently operating under a revised version of the 1971-75 plan for modernizing the national economy on a broad scale, speed-

ing up development, and removing existing disproportions between the principal economic sectors. This plan provides for total new investment of approximately \$58 billion, of which about 25% is allocated to the industrial sector and involves large purchases of capital equipment for export and consumer-oriented manufacturing enterprises.

The current and past plans have generally favored the development of the 18 industries that employ metalworking equipment. In 1972, the end-user industries comprised about 1.6 million workers in 10,000 enterprises. By 1972, investment in these industries had increased to about \$1.1 billion, more than double the 1967 level, while their aggregate sales increased over 70% to about \$12.2 billion (see table 3).

The principal industry sectors using MFE recorded combined shipments of \$4.1 billion and capital expenditures of \$363 million in 1972 (see table 4).

Polish economic plans indicate that capital expenditures by the 10 principal industry sectors using MFE will rise to about \$700 million in 1978, or an average annual increment of roughly 9.6% over the 1974-78 period. Shipments should rise to approximately \$7.8 billion, increasing at the slightly faster rate of about 10.1% over the 4-year period (see table 5). The projected capital expenditure rate is considerably slower than the 19.3% that prevailed in the 1970-74 period. Poland in the past has frequently experienced lengthy time-lags between investment and production, during which scarce foreign exchange expended on capital equipment imports had no prospect of replenishment.

Table 3.—Poland: End-users of metalworking and finishing equipment, by industry, 1972
(in millions of U.S. dollars)

Industry	No. of manufacturers	Value of sales	Value of capital investment	Thousands of workers
Iron and steel	69	2,382	243	177
Metal products	3,820	1,522	175	276
Motor vehicles	227	1,296	128	142
Nonferrous metals	43	1,019	145	61
Miscellaneous transportation equipment	1,063	774	32	149
Heavy electrical equipment	127	639	44	69
Electronics equipment	115	585	63	97
Ships and boats	58	522	28	60
Miscellaneous machinery	618	455	10	96
Building machinery and materials handling equipment	106	453	27	54
Power equipment	45	430	28	61
Equipment for producer goods	82	415	36	68
Instruments, office machinery, optical goods	1,156	375	22	81
Railroad rolling stock	29	367	11	30
Miscellaneous electrical products	2,358	353	30	75
Farm machinery	61	232	16	30
Metalworking equipment	45	203	42	44
Food processing and other consumer equipment	89	172	22	38

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Polish statistics.

Recent policy has shifted to favor projects with speedy startups and a potential for early export earnings.

The automotive industry.—The Polish planning authorities greatly emphasize the automotive industry under a policy promoting motorization as a key factor in developing the country. The industry, which from 1966 through 1972 realized an average annual growth rate of 14%, has embarked on further expansion of plants and equipment, involving the investment of about \$600 million between 1975 and 1978. An accelerated manufacturing schedule should enable the industry to triple 1973 production to meet 1978 assigned targets of 600,000 passenger cars, 120,000 delivery wagons, 50,000 trucks, and 15,000 buses, largely through the importation of complete plants and assembly lines from Western suppliers.

Foreign participation is crucial to the expansion of Poland's automobile industry. For example, two new Polish automobile assembly plants, with a total capacity of 300,000 vehicles annually, will produce the Fiat model 126P, while an existing plant which produces the Fiat 125P is being expanded to a capacity of 150,000 vehicles annually. A bus plant is also expanding to mass-produce buses in cooperation with the French Berliez Company, and negotiations with a U.S. manufacturer are underway for the construction of a new delivery truck assembly plant intended to manufacture 100,000 wagons annually. In addition, Poland is contracting with a U.S. firm to supply equipment for a new foundry for automotive castings.

The Polish automotive industry usually operates under Western licenses in the manufacture of parts. Gearboxes are produced under license by Zahnradfabrik Friedrichshafen (Germany), brake systems by Westinghouse (Germany), shock absorbers by Armstrong (United Kingdom), electrical equipment by Bosh Industrieausrustung, Stuttgart (Germany) and Magnetti-Marelli (Italy), brake linings by Textar (Germany), carburetors by Weber

Major end-user firms and prospective customers in Poland for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—Poland*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Table 4.—Poland: Principal end-users of metalworking and finishing equipment, by industry sector, 1972

(in millions of U.S. dollars)

Sector	No. of plants	Shipments	Capital expenditures
Motor vehicles and parts ..	179	1,008	100
Heavy electrical equipment	123	639	45
Metalworking equipment ..	45	203	45
Power generating equipment	45	431	30
Construction machinery	106	453	30
Other metal products for industrial use	501	455	25
Other metal products for private use	274	380	25
Ball and roller bearings	10	85	25
Tractors and parts	19	222	25
Farm machinery	61	232	15
Subtotal principal sectors	1,363	4,109	364
Subtotal all other sectors	8,298	7,480	640
Total all sectors	9,761	11,588	1,004

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Polish statistics.

(Italy), diesel engines by Leyland (United Kingdom), and fuel pumps by Corona (United States).

The industry's purchases of metalworking and finishing equipment in 1972 were about \$49 to \$53 million and in 1974 are estimated at \$50 to \$57 million. Anticipated 1978 purchases will be between \$57 and \$66 million.

As the industry expands, the following equipment will be needed:

- Gear generating machines
- Mechanical and hydraulic presses for the stamping of wheels
- Cylindrical grinders for grinding crankshafts and camshafts
- Centerless grinding machines
- Transfer lines for the production of crankshaft, axles and cylinder blocks
- Honing and polishing machines for pistons and cylinders
- Metal-cleaning equipment

Heavy electrical equipment and supplies.—Polish programs for rural electrification, railway electrification, and general expansion of power transmission facilities will necessitate continued development of this industry sector. Plans provide for a total investment of roughly \$284 million between 1975 and 1978, to permit power consumption of 96 billion kilowatts in the latter year.

Cable production is a major target of the investment program. A large new continuous production cable factory is under construction, and existing plants are being modernized and expanded.

Electrical motor production is also expanding. Although heavy equipment is still manufactured

according to Soviet specifications, the industry's modern production equipment should lead Poland to consider Western technology. One Polish firm has acquired a license from Hitachi (Japan) for the production of small electrical motors.

The sector's estimated purchases of metalworking and finishing equipment, which in 1972 amounted to approximately \$3.5 to \$4.5 million, should rise in 1974 to an estimated \$5 to \$6 million, and in 1978 to between \$6.5 to \$7.5 million. The new cable factory, in particular, should provide U.S. exporters with good opportunities to furnish advanced equipment. Other areas in the sector should be interested in various types of metal forming machinery of U.S. manufacture.

Metalworking equipment industry.—The machine tool industry, one of the fastest growing sectors of Polish manufacturing, is also a major foreign exchange earner. Although Polish technology in some areas is highly advanced, and licenses are sold to Western industry, production is uneven. Ambitious new development plans therefore center on modernization and reorganization that will employ only the latest technology and best fit the plans for specialization within CEMA. These plans call for limiting the production of standard machine tools, but expanding productive capacity for equipment used in manufacturing bearings, electrical equipment, automotive and other transportation, tractors and other agricultural machinery, as well as for producing more specialized machinery, and centralizing the production of standardized modules. An estimated investment of about \$300 million will be required over 1975-78 period.

The Polish machine tool industry in 1972 invested from \$13.1 to \$15 million in metalworking and finishing equipment. Trade sources expect 1974

purchases of about \$15.8 to \$17.6 million and 1978 purchases of about \$24 to \$27 million as the industry proceeds with development.

Products that should offer good potential to U.S. suppliers include precision machine tools, especially grinding, lapping, and honing machines, milling machines with close tolerances, and numerically controlled machines of all kinds, machining centers, induction hardening equipment, and accessories and tools.

Engines, turbines, and other power generating equipment.—This sector, which includes the manufacture of boilers, turbines, and other installations for the generation of energy as well as the construction of stationary and ship engines, will probably invest an estimated \$190 million between 1975 and 1978. The domestic economy's rising power requirements, a rapidly developing export demand for energy installations, and the expansion of shipyards and other national industries underlie a great increase in demand for such equipment. In addition, the construction of nuclear reactors should begin influencing the industry around 1976.

Purchases of metalworking and finishing equipment by the sector may reach an estimated \$12 to \$15 million in 1978, compared to an expected \$7.9 to \$9.5 million in 1974. In 1972, they amounted to approximately \$6 to \$7.5 million. Equipment with particularly good sales potential for U.S. suppliers should include the following:

- Special lathes for the turning of asymmetrical large pieces
- Copy milling for the manufacture of turbine parts
- Special honing machines for turbine parts
- Numerically controlled multispindle drilling machines for the manufacture of steam turbines
- Heavy double-column milling machines, planer and bed type

Polish manufacture in this sector conforms in part to modern standards, and German turbine producers have subcontracted the manufacture of large shafts to Poland. Nevertheless, the latest American technology could greatly assist the Polish industry in rationalizing its production processes and improving the quality of output.

Foreign cooperation at the present time consists mainly of a licensing agreement with Sulzer (Switzerland) under which Poland produces large diesel engines.

Construction machinery.—Poland's long-term planning for the construction machinery industry envisages the investment of \$229 million between 1975 and 1978 to fulfill contractual obligations toward CEMA countries, expand sales to nonsocialist countries, and supply its own rising domestic demand. Under CEMA agreement, Poland (which now produces baggers and equipment for earth work, mobile cranes, forklift trucks, concrete mixers,

Table 5.—Poland: Capital expenditures of principal end-users of metalworking and finishing equipment, by industry sector, 1970, 1974 and 1978
(in millions of U.S. dollars)

Sector	1970	1974	1978
Motor vehicles and parts	51.2	127.5	150.0
Heavy electrical equipment	28.6	52.5	85.0
Metalworking equipment	22.9	55.0	90.0
Power generating equipment ..	28.7	32.5	57.5
Construction machinery	28.7	40.0	57.5
Other metal products for industrial use	19.0	30.0	55.0
Other metal products for private use	17.5	30.0	52.5
Ball and roller bearings	22.3	42.5	50.0
Tractors and parts	22.3	42.5	50.0
Farm machinery	10.3	32.5	50.0
Total	240.0	484.9	697.5

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Polish statistics and trade source estimates.

drives for construction machines, and construction equipment) will specialize in the production of earthmoving equipment and mobile cranes. The industry therefore plans new productive capacities for mobile telescope cranes, heavy crawler tractors, and hydraulic baggers, and is giving special emphasis to the development of hydraulic motors.

Expenditure estimates by this industry for metalworking equipment should reach \$18 to \$21 million in 1978. By contrast, purchases amounted to between \$9.4 million and \$11.3 million in 1972, and \$12.6 to \$15.8 million in 1974. U.S. suppliers should command a good share of this market because of recently concluded cooperation agreements with American firms for the manufacture of drive axles, gears, crawler tractors, and heavy baggers. Also, Poland intends to modernize plants that were built 15 to 25 years ago and whose technology has become outdated. The best sales prospects are as follows:

- Advanced forging presses
- Equipment for the manufacture of driving axles
- Gearmaking equipment for gear assemblies
- Precision grinders
- Honing machines for the manufacture of motors
- Surface hardening equipment
- Bench brakes

Licenses are continually in demand to upgrade the production of parts and machines. Cooperation agreements in effect at the present time include licenses for the manufacture of mobile cranes (Jones, United Kingdom), hydraulic cranes (Coles, United Kingdom), concrete mixers (Stetter, Germany), and cranes and machines for the building materials industry (Atlas Werke, Germany; and P. L. Schmidt, Denmark).

Other industries.—A number of other industries have modernization plans that should provide opportunities to U.S. exporters of machine tools. Among the projects planned are investment in agricultural tractor production to increase output from the 48,000 units achieved in 1973 to 75,000, the construction of a plant to produce 20,000 milking machines annually, and development of a new precision optical equipment facility. In addition, current planning emphasis is likely to elevate demands for machinery for consumer-oriented industries such as textiles, housewares, and food processing and packaging.

Domestic Manufacture of Metalworking and Finishing Equipment

Poland produces some 350 types of machine tools. Approximate total value of MFE production in 1972 was \$233 million and in 1978, according to trade forecasts, should expand to about \$429 million. In dollar values domestic manufacture in 1972 supplied approximately 50% of the Polish

market; projections place this figure at 40% in 1978.

State economic planners assign specific annual production targets to individual Polish factories after considering both demand and productive capacity. The production target then becomes the yardstick against which the enterprise is measured. Since 1971, the metalworking equipment industry has slightly exceeded assigned goals, indicating fulfillment of plans.

The manufacture of machine tools is highly centralized in an organization called Union Ponar, which produces almost 90% of total output and coordinates total industry production and sales under the supervision of the Ministry of the Machine Building Industry. Union Ponar comprises six "combines," i.e., specialized factory groups, four separate plants, and one service facility—a total of 34 factories.

Kombinat Ponar-Komo, a combine of 6 factories and two construction offices located at Pruszkow, assigns high priority to the production of NC machine tools such as milling machines, drilling machines, machining centers, unit construction machines and transfer lines, diamond boring machines and bed milling machines with automatic cycles. The estimated value of the combine's annual production is \$20 to \$25 million.

Kombinan Ponar-Wafum at Wroclaw manufactures machine tools for rolling elements in its 5 factories. The product range of this combine consists principally of lathes (including NC chuck and center lathes), Swiss type screw machines, copying and multitool lathes, special-purpose lathes for the production of bearings, and automatic transfer lines for machining parts. The annual value of production is about \$20 to \$25 million.

Kombinat Ponar-Jotes is a 6-factory combine located at Lodz. It specializes in grinders, abrasive materials, and abrasive tools. Products include automatic-cycle external center-type grinders, internal grinders with automatic cycles, horizontal or vertical surface grinders, sharpening, lapping, and polishing machines. Abrasive materials include silicon carbides; Aloxite in the form of grains, ceramic, resin or rubber grinding wheels; diamond tools like grinding wheel dressers; and drawing ties. The approximate value of production is \$22.4 million annually.

Kombinat Ponar-Porum at Poreba consists of two factories noted for their heavy-duty machine tools for machining rolling workpieces of diameters above 630 mm and body elements above 1 cm. The combine also produces heavy center lathes, NC and conventional chuck face lathes, and special purpose lathes. Estimated annual production is roughly \$20 to \$25 million.

Kombinat Ponar-Plaso at Warsaw manufactures machines and equipment for working metals and

plastics, and injection molding machines. Machines produced include universal presses, automatic mechanical presses, generation presses, presses for powder metallurgy, universal and guillotine shears, shearing machines, presses for thermosetting plastics and automatic worm injection molding machines, and molds and dies. Annual production is valued at approximately \$22.4 to \$30 million.

Kombinat Ponar-Bial, located at Bialystock, is the producer of fixtures and chucks used in the machining process. The combine produces lathe chucks, drill chucks, machine vices, mechanical fixtures, pneumatic and hydraulic chuck drives, and tools. The estimated value of annual production is about \$7.5 to \$11.2 million.

The products of the other enterprises are as follows: special-purpose machine tools for the railroad industry (Rafamet Works, Kuznia Raciborska); standard units and unit construction machines (Wiepofama Works, Ponzan); cylindrical grinders, rotating perishable tools, and electro-erosion and electro-chemical machining equipment, (Ponar-Tarnow, Tarnow); and hydraulic presses and dies (Hydomat Factory). Ponar-Remo (Warsaw) specializes in the general overhaul of domestically made machine tools. Non-affiliated manufacturers include the Varel Works, producing numerical controls; the Dozamet and Befama factories, producing metal cleaning and finishing equipment; H. Cegielski Metal Works, Ponzan, producing automatic lathes and radial drilling machines; and the K. Swierczewski factory in Warsaw, which produces perishable cutting tools.

The Polish machine tool industry is particularly interested in exporting. Sales in foreign markets, which in 1972 amounted to \$77 million, or 33% of total production, are projected to reach approximately \$183 million, or 43%, in 1978 as Poland establishes more joint venture arrangements with foreign private enterprise. At present, the supply of parts to licensees accounts for a large portion of export trade with nonsocialist countries. Joint ventures have been established with French and Italian firms; a German firm, WEWAG, currently distributes Polish products under its name in Germany and other European countries according to a co-operation agreement.

Poland is also eager to purchase licenses to upgrade its domestic manufacture, and many of its new machinery plants are already producing under Western license. Customarily, Poland will seek "co-operation agreements" under which the licensor agrees to take payment in the form of Polish output. In such cases, the licensor may either integrate the Polish product into a further manufacturing process or market it directly.

Cooperation agreements link the Polish machine

tool industry with a number of leading foreign manufacturers such as—

- Waldrich-Siegen (milling machines) and Gildemeister (automatic lathes) of Germany
- Ceruti (boring machines), Novarese (grinding machines), and La Salle-Simet (machine tools for the automotive industry) of Italy
- SMT Swedish Machine Tool Co. (lathes), and SKT-Malcus (grinding machines) of Sweden
- ABC-Loire (hydraulic presses), Landis-Gendron (grinding machines), Ateliers et Chantiers de Bretagne (lathes), Amtec (automatic lathes) and Societe de Constructions de Monbard (forging machines) of France
- Alfred Herbert Ltd., (grinding machines, lathes) of the United Kingdom

There are no subsidiaries of Western companies now operating in Poland, although a new law permitting 49% foreign participation is being prepared.

Trade Regulations and Practices

Poland does not impose customs duties on imports of metalworking and finishing equipment but does require prior authorization and allocation of foreign exchange within the framework of a specific foreign trade plan drawn up by industry. The system is flexible, however, in that enterprises that earn foreign exchange through exports generally receive priority for their imports; also, planned allocations can be adjusted where cooperation agreements or favorable credit terms apply.

Foreign trade is a state monopoly, administered by the Ministry of Foreign Trade in cooperation with other ministries and implemented by Foreign Trade Organizations (FTO's) which have the sole power to negotiate and sign contracts with foreign firms. For metalworking and finishing equipment, authority has been delegated to the Ministry for the Machine Industry, which has in turn designated Metalexport, a division of the Union Ponar, to act as its FTO. Metalexport also coordinates the total national supply of machine tools, matching demand against production and imports. Address: Metalexport, Warszawa, Mokotowska, 49, P.O. Box 642, Warszawa 1.

U.S. firms desiring to do business with Poland should first acquaint Metalexport with their product lines so that they can be among the sellers considered when prospects for purchases arise. Poland maintains commercial offices in Washington, D.C., New York, and Chicago that can advise American firms about import plans, place them in contact with Metalexport or other appropriate FTO's, and arrange meetings with visiting Polish purchasing missions and trade delegations. Assistance can also be obtained through the Bureau of East-West Trade (B.E.W.T.) of the U.S. Department of Commerce, Washington, D.C. 20230, and from the United

States Trade Development Center operating in Warsaw.

Since certain items of MFE are subject to U.S. export controls; exporters are encouraged to contact the Exporter's Service Section, Office of Export Administration, B.E.W.T., Room 1613, Main Commerce Building, regarding possible or pending transactions.

Sellers may visit Poland to develop trade opportunities directly with Metalexport. Introductions to end-users also can usually be arranged, but to satisfy protocol these should be coordinated with Metalexport. Foreign firms are permitted to engage the services of a Polish enterprise to promote their products and, depending on circumstances, may even place an employee with the organization chosen. These agencies may only represent and promote; they have no authority to negotiate contracts or import on their own accounts.

Metalexport normally tenders for bids, especially where large equipment purchases or substantial orders are involved. A major exception to this rule, however, takes place under cooperation agreements where the supply source is determined by prior negotiations. Metalexport customarily rejects contracts with interest rates above 6%; they also expect an 8 to 15% reduction in the negotiated price upon signing of the contract. Experienced suppliers consider these factors in their initial price quotations.

End-users in Poland usually install individual machines, but foreign suppliers are held responsible for large installations and for servicing such equipment without charge. Training activities may also be required. Performance warranties of 6-12 months are standard. The long-term trend is to pass on to the supplier as much responsibility as possible while seeking concessions in financing or technical co-

operation. Although import contracts currently being negotiated in Poland contain cash terms, barter trade compensation agreements and parallel and switch trading are preferred. The U.S. Department of Commerce publication OBR 73-50, *Trading In Poland*, provides additional details on developing commercial relations with Poland.

Technical Requirements

While Poland has adopted some standards that apply to metalworking and finishing equipment, these are not obligatory for imports. The Polish standards, called *Polska Norma* (PN), are usually derived from or correspond to International Standards Organization (ISO) standards. The issuing agency is the Polish Committee for Standards, Weights, and Measures:

Polski Komitet Normalizacji i Miar (PEKANIM)
Elektoralna 2, Warszawa, Poland

The electric power supply in Poland is a 220/380 volt, 50-hertz, single and 3-phase system, 2- and 4-wire. The country employs the metric system of weights and measures.

Published national standards for metalworking and finishing equipment in Poland may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M Main Commerce Building, Washington, D.C. 20230: "The Market for Metalworking and Finishing Equipment in Poland" DIB 74-09-511, March 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Poland. The table gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by Poland in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Poland: Imports of metalworking and finishing equipment 1968-78, alternate years

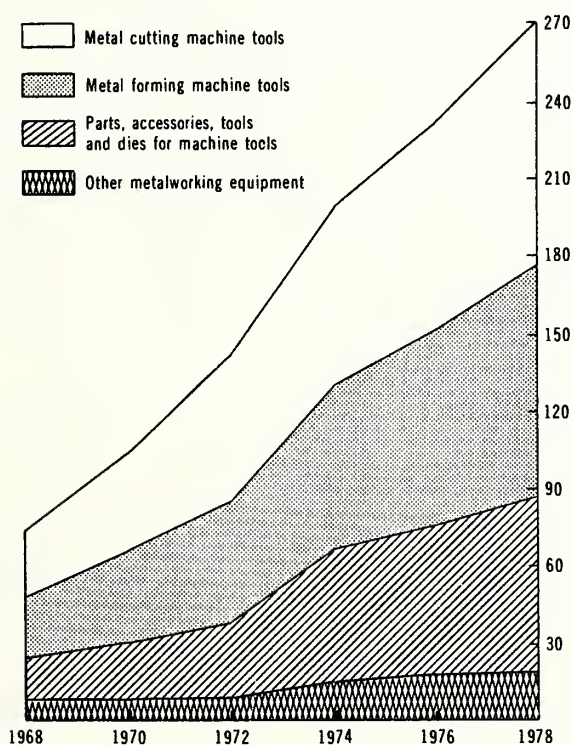
	(in thousands of U.S. dollars)					
Type of Equipment	1968	1970	1972	1974	1976	1978
<i>Metal cutting machine tools:</i>						
Center, special, vertical, and face lathes	5,563	4,857	7,590	9,633	10,486	11,295
Special, automatic and semiautomatic turret lathes ..	7,566	13,450	18,433	28,898	36,226	21,461
Boring machines	5,315	6,723	10,301	16,054	18,113	21,461
Milling machines	7,947	12,933	18,866	28,095	32,413	38,404
Gear generating machines	7,706	8,895	13,445	20,871	24,786	29,368
Vertical shaping, slotting and broaching machines	944	1,642	2,494	3,211	3,813	4,518
Grinding machines, lappers, polishing, tool grinding machines	15,646	18,803	27,216	40,938	49,572	58,735
Drilling machines	1,299	2,355	3,036	4,014	4,767	5,648
Saws, screw tapping, threading machines and other MT for cutting metals	11,952	5,782	7,048	8,830	10,486	12,425
Total	63,938	75,440	108,429	160,544	190,662	225,905
<i>Metal forming machine tools:</i>						
Presses	3,535	5,390	12,746	18,072	21,849	27,374
Hammers	—	—	—	—	—	—
Forging machines	300	293	634	904	705	855
Tube bending and straightening machines	2,662	2,005	4,250	6,024	6,343	6,843
Metal shears	558	698	1,487	1,807	2,115	2,566
Automatic forging and stamping machines	2,148	665	2,124	3,313	4,229	5,133
Total	9,203	9,051	21,241	30,120	35,241	42,771
<i>Other metalworking equipment:</i>						
Other metalworking equipment:	375	778	2,911	7,530	9,940	15,060
<i>Parts and accessories for machine tools:</i>						
Parts and accessories for machine tools:	1,596	2,762	7,022	15,060	25,090	40,151
<i>Tools and dies for machine tools:</i>						
Tools and dies for machine tools:	6,500	8,000	15,389	22,590	27,590	30,121
<i>Metal finishing equipment:</i>						
Metal finishing equipment:	750	2,000	2,720	4,819	7,530	12,530
Total	82,362	98,031	157,712	240,663	296,053	366,538

Source: U.S. Department of Commerce, Bureau of International Commerce, market research study.

Spain

Strong economic growth, characterized by rapidly rising industrial production, has boosted Spain's purchases of metalworking and finishing equipment (MFE) and created new opportunities for American exporters. From 1968 to 1973, Spain's gross national product (GNP) rose by an average of 12.6% per year,¹ while industrial production climbed 13.6% annually and capital investment increased by 11% per year. Higher living standards spurred domestic demand for consumer goods at the same time that many industrial sectors were experiencing

Spain: Consumption of metalworking equipment, 1968-78, alternate years.
(in millions of U.S. dollars)



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and Spanish trade source estimates.

substantial gains in export sales. Spain's economic authorities expect GNP to continue climbing by more than 11% per year, reaching \$97 billion in 1978. Industrial production is slated to rise by more than 8.5% annually during the same period.

Spanish consumption of metalworking equipment, which totaled \$142 million in 1972, is estimated at \$200 million for 1974 and forecast to approach \$275 million in 1978 (see table 1). The market's growth rate, which averaged close to 10% annually during the 1972-74 period, is expected to be over 8% per year through 1978. This forecast, based on Spanish Government projections, could, however, prove conservative. Trade sources report that nearly all end-users plan to expand output and modernize their plants by replacing older equipment with larger, more advanced units. Moreover, new factory construction is booming, in part because of an influx of foreign manufacturers attracted by Spain's relatively low labor costs and by government investment incentives.

Approximately 70% of Spain's stock of metalworking equipment was purchased less than 11 years ago and is still in good operating condition. Nevertheless, there is increasing awareness of the need for gains in productivity through the installation of more advanced machinery. This awareness is generating sales opportunities for foreign suppliers.

The Spanish market for metal cutting machine tools rose from \$57 million in 1972 to an estimated \$69 million in 1974, or by 2% per year. Domestic production increased substantially during this period,

¹ In order to present a more accurate picture, growth rates have been calculated from the local currency values. This method eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	Pesetas/US\$1.00
1968-71	70.00
1972	66.50
1974-78	57.00

but most of the output was exported. The outlook for 1978 suggests that spending for metal cutting equipment may approach \$100 million, reflecting an average annual increase of nearly 9% during the 1974-78 period.

Spanish end-users are estimated to have purchased \$64 million of metal forming equipment in 1974, compared with \$46 million in 1972. This increase represents a 9% average annual growth rate. Spain's 1978 requirements for metal forming equipment are forecast at \$90 million, 40% above their 1974 level.

There is a substantial market in Spain for parts, accessories, and tools and dies for machine tools. Consumption climbed from \$31 million in 1972 to \$52 million in 1974 and could reach \$66 million in 1978. The market for other metalworking equipment, estimated at \$15 million in 1974, is forecast at \$20 million for 1978. Although there is a market for metal finishing equipment in Spain, in the absence of sufficient survey data the discussion in this report concentrates on metalworking equipment only.

Foreign manufacturers normally supply from 50 to 60% of the Spanish market for metalworking equipment; 1974 imports are tentatively placed at \$108 million (see Appendix). Imports accounted for 95% of 1972 consumption of metal cutting equipment and for two-thirds on the parts, accessories, and tools and dies bought by Spanish industry in that year. In contrast, only 18% of metal forming equipment was purchased abroad.

Despite greater customer acceptance of locally made metalworking equipment, the overall ratio of imports to consumption should prevail through 1978. The more farsighted industrialists, anticipating an eventual rise in labor costs, are already adopting ways to streamline their production processes. Only foreign manufacturers can meet the resulting strong rising demand for high production numerically controlled metalworking machinery. Widespread adoption of automated techniques would push imports well beyond the \$133 million value currently forecast for 1978.

Both domestic and European manufacturers are quoting long delivery times on most types of metalworking equipment. American manufacturers who guarantee prompt delivery could greatly increase their sales, since most Spanish firms urgently need the output of the plant facilities now under construction or being renovated.

U.S. suppliers sold \$4 million of metalworking equipment to Spain in 1972, accounting for approxi-

Table 1.—Spain: Consumption¹ of metalworking equipment, 1968, 1972, 1974 and 1978
(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories, tools and dies	Other	Total
<i>1968</i>					
Production	16.6	19.2	12.4	7.8	56.0
Imports	24.6	3.8	9.2	.1	37.7
Exports	15.3	.7	3.4	.1	19.5
Consumption	25.9	22.3	18.2	7.8	74.2
<i>1972</i>					
Production	38.3	40.5	20.4	7.5	106.7
Imports	54.2	8.3	20.8	.7	84.0
Exports	35.2	2.7	10.2	.5	48.6
Consumption	57.3	46.1	31.0	7.7	142.1
<i>1974</i>					
Production	56.8	55.9	38.9	14.4	166.0
Imports	68.6	11.6	27.4	.8	108.4
Exports	46.1	3.7	14.1	.5	74.4
Consumption	69.3	63.8	52.2	14.7	200.0
<i>1978</i>					
Production	83.5	80.0	50.2	20.2	233.9
Imports	84.5	14.3	33.7	.9	133.4
Exports	70.6	4.6	17.8	.7	93.7
Consumption	97.4	89.7	66.1	20.4	273.6

¹ Consumption equals production plus imports less exports.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and Spanish trade source estimates.

mately 5% of the import market. Germany, with 36% of the market, was Spain's principal foreign supplier; Italy supplied 11%, the United Kingdom 8%, and Japan 3% (see table 2).

Spanish buyers of metalworking equipment are reported to be virtually unanimous in their opinion that American equipment is unequaled in terms of quality, reliability, and technological sophistication. These factors are particularly important to them as they shop for numerically controlled (NC) machinery. Their experience in obtaining adequate after-sale service, however, has not been as satisfactory. Factory-sponsored training programs and more frequent visits by manufacturers' representatives are needed to reinforce dealer sales efforts.

U.S. manufacturers of metalworking equipment accounted for 3.3% of Spain's 1972 imports of metal cutting machine tools, 2.4% of its imports of metal forming machine tools, and 9.3% of its foreign purchases of parts, accessories, and tools and dies for machine tools. Specific items for which U.S. sales to Spain exceeded \$100,000 in 1972 include automatic multiple-shaft horizontal lathes; tool and cutter, cylindrical, and surface grinders; grinding and polishing machines; gear cutting machines; presses; thread-cutting machines; forging and stamping machines; and tools and dies.

Sales Opportunities

A market research survey recently conducted in Spain for the U.S. Department of Commerce, Office of International Marketing points out the specific sectors of the Spanish market for metalworking equipment in which promotional efforts by American manufacturers are most likely to result in increased sales. The sales potential of each of the various classes of equipment was assessed on the basis of statistical data on past imports, the response to a questionnaire mailed to leading equipment users, personal interviews, and an evaluation of the current

Spain—Age of Metalworking Equipment Currently In Use

Age of equipment	Percent
less than 5 years old	35
6 to 10 years old	36
11 to 15 years old	17
over 15 years old	12
Total	100

Source: U.S. Department of Commerce, Bureau of International Commerce Market Research Study.

and future production capabilities of the domestic metalworking equipment industry.

Bending and forming machines.—Bending and forming machines consistently rank near the top of the list of metalworking equipment items imported by Spanish industry. Imports of this class of equipment accounted for \$7.8 million in 1972. U.S. exporters sold \$100,000 worth of bending and forming machines to Spain in that year. Imports could more than double in the next few years, reaching \$18 million in 1978.

Germany and Japan are Spain's principal foreign sources of bending and forming machines. This area is one of the few in the Spanish metalworking equipment market in which Japan has been successful; users bought \$1 million worth of Japanese bending and forming machines in 1972. Italy, the United Kingdom, and France are said to be losing this market as demand shifts to more highly automated equipment.

Foreign suppliers cannot compete with domestically made small, manual, and power-assisted single operation bending and forming machines. The market is wide open, however, to most large, multi-operation machines and all classes of automatic equipment. In fact, the Spanish government has re-

Table 2.—Spain: Imports of metalworking equipment from selected countries, 1972

(in thousands of U.S. dollars)

	U.S.	Germany	U.K.	Japan	Italy	Other	Total imports
Metal cutting							
machine tools	1,804	21,074	4,152	982	6,153	20,031	54,195
Metal forming							
machine tools	201	2,857	857	1,062	1,083	2,257	8,317
Subtotal metal-working equipment	2,005	23,931	5,009	2,044	7,235	22,288	62,512
Machine tool parts, accessories, tools and dies.....	1,932	6,226	1,447	253	1,786	9,168	20,812
Other.....	1	69	10	—	271	356	707
Total	3,938	30,226	6,466	2,297	9,292	31,812	84,031

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and Spanish trade source estimates.

duced the tariff on such equipment from 24 to 5%, specifically to encourage industry to invest in the larger capacity equipment. Users are now looking for large capacity, automated bending and forming machines of higher quality than those currently offered by Japanese and European suppliers. In this instance, the versatility and production capacity of the equipment are more important than is price. American manufacturers, therefore, have an excellent chance of improving their share of this market. A few of the items in this equipment class having especially high sales potential are as follows:

- Automatic and semiautomatic machines for multiple operations such as cutting, bending, and forming light sheet metal into compound shapes
- Numerically controlled and automatic machinery for cutting, bending and forming tube stock
- Machinery for bending and forming large sections of plate stock of up to 1/4-inch thickness
- Combination machines for multiple operations, such as, positioning, forming, and welding on sheet metal and aluminum

Hydraulic and mechanical presses.—Presses are the best selling class of foreign-made metalworking equipment in Spain; \$12 million worth were imported in 1972 alone. Moreover, U.S.-made presses have sold well in Spain and are highly regarded by Spanish users.

The market for presses is highly competitive. Spanish manufacturers have a decisive price and servicing advantage within the range of basic presses that they produce. Germany and France can offer as wide a selection as American manufacturers, and at prices that reflect the substantial difference in transportation costs. Fast delivery plus additional promotion of certain types of presses could help American exporters increase their share of this market.

Demand from the booming motor vehicle, shipbuilding, and home appliance industries could boost sales of imported presses beyond the \$20-million level currently predicted for 1978. Many major users hope to double the output of their factories during the next 5 years. Such customers are particularly interested in:

- Presses for bending and forming heavy plate used in shipbuilding and in bus and truck chassis
- High-production presses for stamping large panels of sheet metal for use in automotive, appliance, and aircraft manufacture
- High-speed, automatic or semiautomatic mechanical presses to form small parts
- Multiple-station, automatic vertical presses for forming either hot or cold stock

Lathes.—Spain imported over \$11 million worth of single and multiple-spindle copy and numerically controlled lathes in 1972, compared with \$3 million in 1968. Planned expansion of production facilities in Spain's basic industries, notably in shipbuilding

and motor vehicle manufacture, could boost imports to \$25 million in 1978.

Germany and France together account for 63% of Spain's imports of automatic lathes. Other important suppliers include the United Kingdom, Italy, and Switzerland. Germany dominates the Spanish market for large or specialized types of lathes, selling almost as much as the second- and third-ranked suppliers (the United Kingdom and France) combined. German sales rose steadily from \$600,000 in 1968 to \$4.4 million in 1972 as the result of a carefully mounted promotional campaign.

Local manufacturers make only limited quantities of automatic bar feed, turret, and tracer lathes. Eventually domestic lathe manufacturers may begin to compete with foreign suppliers by adding imported tracer controls and numerical controls to their high-quality basic lathes. For the time being, however, they are barely able to keep up with domestic and export demand for standard lathes.

Spanish companies can, in many cases, buy special-purpose lathes from American manufacturers more cheaply than they can from other sources. Lathes that must be special-ordered from European suppliers are often stock production items in the United States. Vigorous sales promotion and adequate technical support could make such lathes the sales leader for U.S. exporters of metalworking equipment. Other suppliers cannot equal the performance and reliability of American-made lathes. Trade sources report strong interest in lathes of the following types:

- Small (6"-10" swing to 36" between centers), NC and automatic
- Heavy-duty vertical lathes, over 72", NC and automatic
- Large horizontal lathes (over 6' between centers)
- Automatic saddle type turret
- Facing lathes with tracer
- Thread cutting lathes

Transfer machines.—Demand for this type of metalworking equipment is especially high at present because of the large-scale expansion of Spain's plant facilities and the attendant need for additional assembly line equipment. Imports are estimated to have totaled \$3.4 million in 1972 and are forecast to reach \$10.5 million for 1978.

The United States, recognized as the world leader in assembly line operation and multi-function automated machines, should be able to increase its share of this sector of the Spanish market for imported metalworking equipment from the 5.4% recorded in 1972. The fact that quality and engineering design are far more important to the buyer than other considerations also favors American suppliers.

Since foreign firms with manufacturing subsidiaries in Spain usually prefer to install the same types of metalworking equipment used in their home factories, the roster of principal supplier countries varies from year to year. France has been the sales leader

Table 3.—Spain: End-users of metalworking equipment, by industry, 1971

(in millions of U.S. dollars)

Industry	No. of manufacturers	Value of sales	Value of capital inv.	No. of workers
Motor vehicles, bicycles and parts	58	1,125.7	57.1	72,420
Electrical machinery and parts	6,328	1,106.4	41.7	124,192
Industrial machinery and parts	20,905	608.0	33.3	82,211
Tools, cutlery, and hardware	25,461	1,174.9	29.5	197,722
Iron and steel products ¹	237	903.6	26.3	81,785
Tin products	3	27.1	.2	236
Optical and photographic products, timepieces, musical instruments, and parts thereof	1,077	76.3	13.6	15,812
Shipbuilding	39	585.0	13.5	44,592
Copper products	17	452.5	2.7	6,627
Aluminum products	8	288.6	1.5	4,872
Miscellaneous metals and products thereof	6	45.4	.9	740
Railway equipment	72	122.8	.8	16,374
Lead, silver, and antimony products	13	54.2	.2	1,032
Aircraft and aircraft parts	9	33.5	22.9	4,564
Zinc products	6	53.8	²	1,471

¹ Data is for 1968.

² Less than \$100,000.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics.

since 1970, chiefly because of purchases by the Spanish subsidiaries of Renault and Simca. Germany ranks a close second.

Way type transfer machines used in the motor vehicle, home appliance, and metal furniture industries offer the greatest potential for increased sales. Other types of transfer machines for which there is strong demand include:

- In-line transfer machines
- Rotary transfer machines
- Unit heads, boring
- Unit heads, drilling
- Unit heads, milling

Other sales opportunities.—Additional types of metalworking and finishing equipment that market analysts suggest American manufacturers might successfully sell in Spain are:

- Numerical controls and tracer controls for retrofitting
- Thread-producing machines
- Punching and shearing machines
- Grinding machines
- Boring machines—horizontal and vertical
- Sawing, filing, and cutoff machines
- Presses
- Planing, shaping, slotting, and broaching machines
- Electrical discharge and electrochemical machines
- Polishing, lapping, honing, and finishing machines

Several leading end-users of metalworking equipment have begun to investigate numerically controlled machine tools as a hedge against expected shortages of skilled labor and high wages. Most users regard American NC equipment as superior to that of Germany, its chief competitor. Automobile makers are interested in NC machine tools to eliminate the need for highly skilled machinists to make replace-

ment parts and other items. Manufacturers of metal furniture and home appliances are seeking ways to apply NC technology to obtain higher output and greater accuracy in forming and welding operations. Direct numerical controls have not yet aroused the interest of the relatively few manufacturers that could afford to purchase them.

Sales of NC positioning systems could represent an important part of the Spanish market for imported metalworking equipment in the years just ahead. Most buyers will purchase such systems as part of new equipment but will also modify existing equipment. The domestic metalworking industry, however, could be a potentially important customer for these units.

Many end-users have expressed interest in learning more about electrical discharge machining (EDM) and electrochemical machining (ECM) equipment. Nearly 20% of the end-users interviewed in connection with a recent market survey are presently using such equipment. In fact, one Spanish manufacturer has started making EDM equipment.

End-User Industries

In 1971, the most recent year for which data are available, industries that make extensive use of metalworking equipment valued their capital investment at \$244 million and reported aggregate sales of \$6.7 billion (see table 3). Several industries—aluminum, tin, zinc, certain other nonferrous metals and metal products, electrical machinery, aircraft, and shipbuilding—doubled their output between 1966 and 1971. Both government economists and private sector sources express confidence that this

Table 4.—Spain: Principal end-users of metalworking equipment, by industry sector, 1971

(in millions of U.S. dollars)

Sector	No. of plants	Shipments	Capital investment
1. Motor vehicles, bicycles, parts	58	1,125.7	57.1
2. Iron and steel products ¹	237	903.6	26.3
3. Fabrication of electrical goods for telecommunications and cinematography	1,847	304.9	15.5
4. Shipbuilding	39	585.0	13.5
5. Miscellaneous machinery	16,563	96.3	12.4
6. Professional and scientific instruments, medical, scientific, and office equipment (nonelectric)	590	70.5	12.1
7. Boilers and other heavy industrial equipment	4,672	318.3	10.1
8. Electrical appliances for home and commercial use	437	222.0	9.3
9. Hardware, ironwork, and heating equipment	17,162	215.4	8.7
10. Batteries, dry cells, and carbon electrodes	97	52.8	7.7
Subtotal principal sectors	41,702	3,894.5	172.7
Subtotal all other sectors	13,355	1,946.1	47.9
Total all sectors	55,057	5,840.6	220.6

¹ Data is for 1968.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics.

expansion will continue in the years ahead, although at somewhat more moderate rates.

The industry sectors that ranked among the top 10 in terms of consumption of metalworking equipment had shipments of \$4 billion and capital investment of \$173 million in 1971 (see table 4). The motor vehicle and the iron and steel products sectors led with shipments of \$1.1 billion and \$904 million, respectively. Both of these industrial sectors are expected to increase the 1971 value of their capital investment almost tenfold by 1978; capital investment in the shipbuilding industry is expected to increase six times, and other sectors will probably double the value of their capital goods by 1978 (see table 5). Cumulative value of capital goods installed by firms in the 10 leading end-user industries is estimated at \$600 million for 1974 and is expected to rise to nearly \$1 billion in 1978.

Major end-user firms and prospective customers in Spain for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—Spain*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications and associations.

Manufacturers of motor vehicles.—Spanish manufacturers of cars, trucks, tractors, and buses are

spending record sums on metalworking equipment and other machinery in an effort to double their output by 1976. The construction of a new Ford plant is one of the country's largest industrial projects. The industry's capital outlays totaled an estimated \$180 million in 1974. Spending may decline somewhat when the present expansion program is completed; projections suggest capital expenditures will amount to \$120 million in 1978.

The motor vehicle industry obtains much of its metalworking equipment from domestic manufacturers; but transfer machines, large presses for stamping body panels, automatic boring machines, and surface grinders are likely to be purchased from foreign suppliers.

Iron and steel.—Blessed with abundant reserves of coal and iron ore, Spain has been able to increase its output of ferrous metals by 20% annually in recent years. The production of finished metal goods has paralleled the growth of primary metal production. The recent tightening in world supplies of key raw materials has strengthened demand for relatively low-priced products of Spain's iron and steel industry, and the expected continuation of this trend suggests that the industry may be able to maintain a 20% growth rate through 1978.

Official figures show that the iron and steel industry invested \$43.5 million in machinery in 1972. Analysts estimate 1974 capital expenditures at \$60 million and expect them to reach \$124 million in 1978. Types of metalworking equipment likely to be purchased from American suppliers include punching and shearing machines, presses, wire forming machines, bending and forming machines, and forging machines.

The technology of Spain's iron and steel industry

Table 5.—Spain: Capital investment of end-users of metalworking equipment, by industry sector, 1971, 1974 and 1978

(in millions of U.S. dollars)

Sector	1971	1974	1978
1. Motor vehicles, bicycles, and parts	57.1	336.8	526.3
2. Iron and steel products	26.3	166.7	263.1
3. Fabrication of electrical goods for telecommunications and cinematography	15.5	¹	¹
4. Shipbuilding	13.5	50.9	79.0
5. Miscellaneous machinery	12.4	19.3	23.5
6. Professional and scientific instruments, medical, scientific, and office equipment (nonelectric)	12.1	¹	¹
7. Boilers and other heavy industrial equipment	10.1	17.2	26.0
8. Electrical appliances for home and commercial use	9.3	¹	¹
9. Hardware, ironwork, and heating equipment	8.7	13.1	17.4
10. Batteries, dry cells, and carbon electrodes	7.7	12.3	14.0
Total	172.7	616.3²	949.3²

¹ Data insufficient to permit forecasting.

² Partial total owing to missing data.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Spanish trade source estimates and official trade statistics.

is based more on the use of skilled workers than is that of the United States and most Western European nations. Rising labor costs, however, are leading plant managers to consider investing in automated equipment.

Communications equipment.—The manufacture of communications equipment is one of Spain's outstanding growth industries. If, as expected, the Spanish government carries out its commitment to modernize and expand the country's entire communications network, communications equipment production could rise by as much as 25% annually during the next few years. The sector's capital outlays consequently would climb from \$4.7 million in 1974 to \$10 million in 1978.

Metalworking equipment is used to a lesser extent in the communications equipment industry than in some other industrial sectors. Quality equipment is required, however, to produce metal parts that meet exacting technical standards. Spain's communications equipment manufacturers make up a potentially significant market for imported numerically controlled lathes, transfer machines, and automatic or semiautomatic bending and forming machines.

Shipbuilding.—Spain is a world leader in shipbuilding, which is one of the cornerstones of the country's highly successful 5-year development plans. The industry is expected to expand by an average of 20% annually during the next few years.

Spanish shipbuilding firms are estimated to have spent approximately \$15 million for metalworking equipment in 1972 and \$18 million in 1974; they may spend as much as \$36 million in 1978. Since the industry is largely government financed, Spanish law requires that much of this equipment be sup-

plied by domestic manufacturers. Shipbuilders, however, need substantial quantities of equipment that can best be supplied from abroad. A list of such machinery would include large hydraulic presses, heavy-duty forming and bending machinery, vertical and horizontal boring mills with diameters of 6 feet or more, and engine lathes of 9 feet between centers or larger.

Domestic Manufacture of Metalworking and Finishing Equipment

Spanish production of metalworking equipment for 1974 is estimated at more than \$165 million, compared with \$107 million in 1972. Output rose by almost 16% a year between 1968 and 1974. The next few years, however, are likely to see a more modest rate of growth. Projected annual increases averaging 9% between 1974 and 1978 could result in production of nearly \$235 million in 1978.

New orders for metalworking equipment in Spain normally rise and fall within 4-year industrial cycles. Having peaked in 1969 and 1973, new orders could normally be expected to decline in the 1974-75 period, turn up in 1976, and peak again in 1977. However, a steady rise through 1978 is expected if plans for expansion by user industries are fully implemented and government fiscal policies designed to moderate the fluctuations in industrial production are effective.

Spain's metalworking equipment industry supplies 40 to 50% of the domestic market. Lathes, boring machines, and milling machines are its principal products. Manufacturers limit their product lines to standard models of light or medium capacity; however, they have taken rapid strides in improving

the design, quality, and reliability of the machinery they produce. Domestic metalworking equipment is steadily gaining acceptance among Spanish end-users, notably the motor vehicle and shipbuilding industries.

Spanish metalworking equipment has also earned a place in export markets. Sales to other countries have risen even more rapidly than has domestic production. Exports climbed from \$20 million in 1968 to an estimated \$75 million in 1974, or by an average of 21% per year during the 6-year period. The outlook is for exports to approach the \$100-million level in 1978. Approximately half the exported metalworking equipment is destined for European nations. Sales made in 1973 to buyers in the United States accounted for only about 2% of Spain's total MFE exports.

Domestic manufacturers of metalworking equipment receive favorable tax treatment on exported goods. They can also take advantage of low-cost export financing and assistance in establishing overseas sales offices.

The domestic metalworking equipment industry is composed of fairly small firms. The National Metal Syndicate reported in 1967 that there were 337 individual factories, 75% of which had fewer than 50 employees. Almost all the companies are owned by Spanish interests. Furthermore, the manufacture of metalworking equipment under license from foreign firms has declined to about 10% of production.

Trade Regulations and Practices

Spain levies import duties of from 5 to 24% on the cost, insurance, and freight (c.i.f.) value of imported metalworking equipment. Most types of equipment are assessed duties at the upper end of this range. A 12% tax (the Impuesto de Compensacion

de Gravamenes Interiores) levied on the c.i.f.-plus-tariff value of all imported goods compensates for the turnover taxes paid by domestic manufacturers. Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce Domestic and International Business Administration, Room 4127 Main Commerce Building, Washington, D.C. 20230.

The reciprocal trade agreement between Spain and the European Economic Community (EEC) has the effect of giving a slight preference to goods manufactured within the EEC.

Technical Requirements

The characteristics of Spain's electrical supply are 110/220-volt, 50 hertz, single-phase and 127- 20., 380., and 500-volt, 50 hertz, 3-phase.

The metric system of weights and measures is the statutory standard in Spain.

Published national standards for metalworking and finishing equipment in Spain may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018. U.S. standards for metalworking equipment are accepted by both Spanish authorities and end-users.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230:

"The Market for Metalworking and Finishing Equipment in Spain," DIB 74-08-506, March 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Spain. The table gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by Spain in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Spain: Imports of metalworking equipment, 1968-78 alternate years

(in thousands of U.S. dollars)

Type of equipment	1968	1970	1972	1974	1976	1978
<i>Metal cutting machine tools:</i>						
Spark erosion, ultrasonic, and electrolytic machines	157	343	541	684	772	842
Horizontal automatic lathes, multiple shaft	743	1,843	3,579	4,526	5,053	5,579
Horizontal automatic lathes, single shaft	1,414	1,943	5,564	6,860	7,649	8,456
Horizontal semiautomatic lathes, with or without revolving turret; more than 90 mm. bar	14	43	75	95	107	118
Other horizontal semiautomatic lathes	529	257	391	825	912	1,018
Horizontal capstans, including copying; more than 10,000 kg.	157	186	692	544	614	684
Other horizontal capstans, including copying; 5,000-10,000 kg.	243	500	451	649	684	754
Standard lathes, including copying; less than 2,000 mm. dia. or 30,000 kg. unit weight	371	529	436	614	684	754
Other lathes of more than 5,000 kg.	314	814	181	755	843	930
Other lathes	43	329	90	137	153	172
Automatic boring-milling machines; horizontal, universal, fixed, or movable shaft: more than 180 mm. bar or 50 kg. unit weight	357	529	993	1,175	1,298	1,439
As above; over 50 kg. unit weight	371	471	722	965	1,070	1,175
Automatic boring-milling machines; others	343	329	1,203	1,228	1,368	1,526
Automatic shapers; more than 5,000 mm. lgt or 30,000 kg. unit weight	114	—	45	54	61	68
Automatic shapers; less than 5,000 mm. lgt or 30,000 kg. unit weight	29	14	211	135	153	168
Shaping, sawing, cutting, broaching, and slotting machines	957	900	1,910	2,333	2,596	2,877
Grinders and drills	1,743	1,671	3,880	4,860	5,439	6,000
Machines to sharpen, trim, shape, grind, polish, buff, and do other operations with grindstones, abrasives, or polishing agents	4,457	6,986	12,120	14,474	16,140	17,825
Body grinders	229	571	1,053	1,035	1,140	1,263
Gear-cutting machines for noncircular blanks	200	557	346	509	579	632
As above for cylindrical blanks	371	671	1,699	1,368	1,826	1,684
Presses	5,843	4,986	10,331	13,053	14,298	15,790
Thread-cutting machines, internal or external	214	400	481	684	772	842
Wire drawing mill	914	443	2,075	2,053	2,298	2,544
All other metal cutting machines	4,471	5,829	5,579	9,018	10,263	11,316
Total	23,184	31,144	54,648	68,633	76,772	84,456
<i>Metal forming machine tools:</i>						
Machines other than presses to curve, bend flatten, shear, edge, and shape	2,000	3,000	6,015	7,684	8,561	9,456
Forging, stamping, and punching machines	86	1,343	707	1,298	1,456	1,597
Wire forming machines	829	914	1,008	1,912	2,140	2,351
Machines for manufacturing metal containers	871	643	587	702	772	877
Total	3,786	5,900	8,317	11,596	12,920	14,281
<i>Parts and accessories, tools and dies for machine tools:</i>						
Universal mounting bases	3,086	4,986	8,135	9,983	11,123	12,281
Tools and dies for machine tools	5,971	8,086	11,038	15,193	16,947	18,719

Spain: Imports of metalworking equipment, 1968-78 alternate years.—Con.

(in thousands of U.S. dollars)

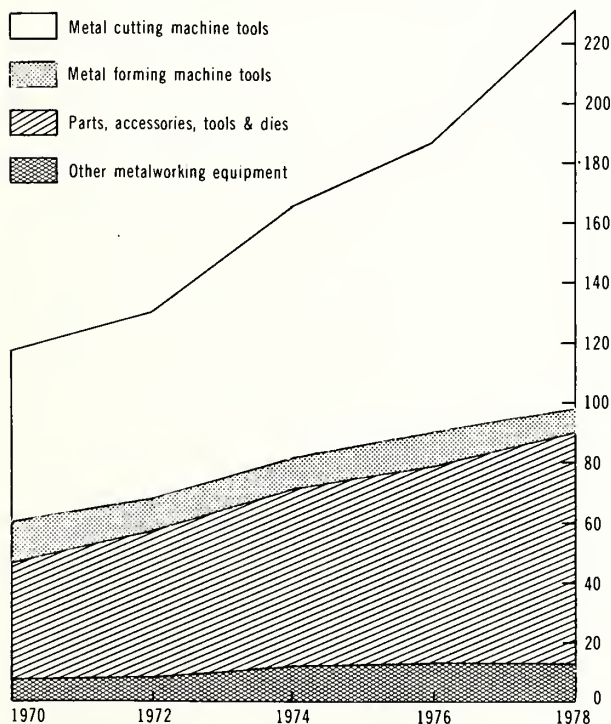
Type of equipment	1968	1970	1972	1974	1976	1978
Sintered metal carbide tool tips	200	657	1,639	2,263	2,526	2,790
Total	9,257	13,729	20,812	27,439	30,596	33,790
<i>Other metalworking equipment:</i>						
Indexing and copying machines of all classes	71	257	602	679	754	837
For nuclear fuels, numerical control, etc.	—	—	105	75	84	93
Total	71	257	707	754	838	930
Total metalworking and finishing equipment.....	36,298	51,030	84,484	108,422	122,135	133,457

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Value based on Spanish trade source estimates and official trade statistics.

Sweden

Sweden's highly industrialized economy promises an important and growing market for U.S. metalworking and finishing equipment (MFE). Industrial production accounts for almost two-thirds of the country's gross national product (GNP). Such production is expected to rise at an annual rate of 6.5%¹ through 1978, boosting GNP from \$50.4 billion in 1973 to over \$60 billion in 1978. During the same period, capital investment (excluding housing), is expected to rise from \$8.5 billion to almost \$10 billion.

Sweden: Consumption of metalworking equipment, 1970-78, alternate years.
(in millions of U.S. dollars)



Domestic consumption of metalworking equipment rose at an average rate of 9% a year from \$125 million in 1972 to nearly \$168 million in 1974 (see table 1). Market growth is projected to average 6% a year from 1974 to 1978, resulting in purchases of more than \$210 million annually before the end of the 1970's. Although Sweden also has a significant market for metal finishing equipment, trade statistics on such equipment are not available. The discussion in this survey therefore will concentrate on metalworking equipment.

Sweden prides itself on having some of the most modern metalworking and finishing equipment in Europe. Approximately 25% of the machine tools in Sweden have been purchased within the last 5 years, and about 35% are between 6 and 10 years old. The rate of replacement is expected to remain high as Swedish manufacturers continually upgrade and modernize production.

The country's metal cutting machine tool market has grown by 12% a year, rising from \$60.5 million in 1972 to almost \$86 million in 1974. The market is expected to rise by close to 7% annually from 1974 to 1978, exceeding \$111 million in the latter year.

Investment in metal forming machinery is projected to rise at the moderate rate of 3% a year during the next 4 years and to approach \$9 million in 1978. This market expanded from \$6.8 million in 1972 to nearly \$8 million in 1974. Sweden's purchases of other metalworking equipment should

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Swedish official trade statistics and trade source estimates.

¹ In order to present a more accurate picture, growth rates have been calculated from the local currency values. This eliminates the effect of changes in currency alignments, although the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	Skr/US\$1.00
1968-70	5.17
1972	4.75
1973-78	4.20

approach \$15 million in 1978, up from \$13 million in 1974 and \$9.5 million in 1972.

The sizable market for machine tool parts and dies has achieved a 6% average annual growth rate, climbing from \$48 million in 1972 to more than \$61 million in 1974. This market is expected to total \$75 million in 1978.

With \$2.7 billion in foreign reserves as of December 1973, Sweden is in a favorable position to step up purchases of imported machinery. Imports of metalworking equipment in 1972 were valued at \$84.5 million, or about 68% of the total market in that year (see Appendix). Between 1974 and 1978, purchases from abroad are expected to increase by more than 5% annually, expanding from an estimated \$109 million to exceed \$133 million.

American manufacturers in 1972 provided Sweden with \$7.9 million worth of metalworking machinery, or 9% of the import market (see table 2). If present trends continue, imports from the United States should approach \$12 million in 1978.

European producers are keen competitors in the Swedish metalworking equipment market. Germany was Sweden's largest foreign supplier in 1972, providing equipment worth \$35.7 million, or 42% of the import market. Purchases from the United Kingdom in 1972 amounted to \$10.1 million, a 12% market share. Italy's share was 5% that year, and Japan's stood at 3%. Eastern European countries are producing increasingly sophisticated heavy metalworking machinery which is expected to be competitive in the Swedish market in the near future.

A breakdown of the import market reveals that American manufacturers provided 10% (\$5 million) of the metal cutting machinery purchased abroad in 1972. Imports from the United States should total about \$6 million in 1976. Germany was the largest foreign supplier of metal cutting equipment in 1972, with a 42% market share. The German share is projected to decline somewhat to 36%, or \$27 million, in 1976.

Table 1.—Sweden: Consumption¹ of metalworking equipment, 1968, 1972, 1974, and 1978

(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories, tools and dies	Other metalworking equipment	Total
1968					
Production	n.a. ²	4.6	33.4	9.5	n.a.
Imports	n.a.	4.3	9.1	n.a.	n.a.
Exports	n.a.	2.1	21.3	n.a.	n.a.
Consumption	n.a.	6.8	21.2	n.a.	n.a.
1972					
Production	53.1	7.7	60.8	8.2	129.8
Imports	49.8	7.4	19.6	7.7	84.5
Exports	42.4	8.3	32.3	6.4	89.4
Consumption	60.5	6.8	48.1	9.5	124.9
1974					
Production	80.4	11.8	76.7	9.7	178.6
Imports	66.5	9.3	23.9	9.7	109.4
Exports	61.1	13.2	39.4	6.7	120.4
Consumption	85.8	7.9	61.2	12.7	167.6
1978					
Production	108.5	17.0	92.7	10.4	228.6
Imports	84.2	10.7	27.0	11.4	133.3
Exports	81.3	19.0	44.5	7.1	151.9
Consumption	111.4	8.7	75.2	14.7	210.0

¹ Consumption equals production plus imports minus exports.

² n.a.—not available.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Swedish official trade statistics and trade source estimates.

The U.S. share of the Swedish import market for metal forming machinery is projected to increase slightly from 4% in 1972 to 5% in 1976, when imports from the United States are anticipated to approach \$500,000. American suppliers provided 11% of Sweden's 1972 purchases of foreign-made parts, tools, and dies for machine tools, or \$2.1 million, and are expected to maintain this share through 1976. Germany and the United Kingdom were the two other major foreign suppliers in 1972, providing \$7.6 million and \$3.1 million, respectively.

Sales Opportunities

American manufacturers of metalworking machinery are in a good position to profit from the continuing trend in Sweden toward further automation of production operations. A market study recently conducted in Sweden for the U.S. Department of Commerce, Office of International Marketing, reveals favorable sales opportunities for American manufacturers of the following products:

Numerically controlled machines.—Sweden was one of the first European countries to install numerically controlled (NC) metalworking machinery. A scarcity of skilled workers and the consequent steep labor costs, coupled with frequent short production runs, have led Swedish manufacturers to utilize NC machinery on a wide scale.

Swedish businessmen are continuing to look to numerically controlled systems in order to streamline operations and further reduce labor costs. The number of NC machining center installations in Sweden is currently estimated to be between 10 and 15. An estimated 22 orders were placed during 1973, and trade sources anticipate that between 60 and 80 NC machining centers will be purchased annually for the next 3 to 5 years. The American firm Kearney & Trecker sold about 8 of the 1973 orders. The leading supplier is Kongsberg of Norway. Sweden's forward-looking business community is receptive to new suppliers. A local company, TELUB, is available to service NC systems.

Swedish producers of NC machines are SMT (Swedish Machine Tools) Machine Company AB, Sandens Mekaniska Verkstad, AB Torshallamaskiner, Varnamo Maskin AB, and Pullmax AB. SMT is the only company making its own numerical controls.

Foreign competitors are actively promoting their NC machinery in the Swedish market. The German companies—AND, Gildemeister, Manforts, Pittler, Schiess AG, Burkhardt, and Fritz Werner—all export NC machines to Sweden. A number of U.S. subsidiaries with manufacturing facilities in Great Britain are also active in Sweden. These include

Sweden—Age of metalworking and finishing Equipment Currently in Use

Age of equipment	Percent
less than 5 years old	25
6 to 10 years old	35
11 to 15 years old	30
over 15 years old	10
Total	100

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

Warner & Swasey, Brown & Sharpe, Giddings & Lewis, Kearney & Trecker, and Cincinnati-Milacron. LeBlond and Pratt & Whitney sell numerically controlled machinery direct from the United States.

U.S.-made numerically controlled machinery, highly regarded for its technological superiority, is used widely throughout Sweden. Good sales opportunities exist in the near future for American manufacturers of the following types of NC equipment:

- Boring machines
- Drilling machines
- Grinding machines
- Milling machines
- Engine lathes
- Turret lathes, horizontal
- Turret lathes, vertical
- Machining centers

The Swedish market for all types of lathes reached \$17 million in 1972 and is expected to approach \$28 million in 1978. About 57% of the horizontal lathes and 3% of the vertical lathes used in Sweden have numerical controls. These proportions should grow steadily through 1978, when the market for NC lathes is projected to reach a minimum of \$18 million.

The country's purchases of milling machines were valued at \$12 million in 1972 and should exceed \$25 million in 1978. About 10% of this type of equipment currently in use is numerically controlled. If present trends continue, the market for NC milling machines is expected to top \$2.5 million in 1978.

Numerical control systems are being used on about 14% of the drilling machines now in operation. Roughly 10% of the multioperational equipment is numerically controlled. Trade sources report that the market for machining centers was estimated at \$7.6 million in 1974 and should expand rapidly through 1978.

Swedish users also are interested in digital readouts and numerical controls. U.S. manufacturers of such equipment again command a leading position in the market. One American firm, Slo-Syn, has experienced considerable success in selling its

Table 2—Sweden: Imports of metalworking equipment from selected countries, 1972

(in millions of U.S. dollars)

Equipment	U.S.	Germany	U.K.	Japan	Italy	Other	Total
Metal cutting machine tools	5.0	21.1	6.1	1.8	2.7	13.1	49.8
Metal forming machine tools .....	.3	2.3	.8	.7	.2	3.1	7.4
Subtotal, metalworking equipment	5.3	23.4	6.9	2.5	2.9	16.2	57.2
Machine tool parts, accessories, tools and dies	2.1	7.6	3.1	.3	1.4	5.1	19.6
Other metalworking equipment .....	.5	4.7	.1	.1	.1	2.2	7.7
Total	7.9	35.7	10.1	2.9	4.4	23.5	84.5

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Swedish official trade statistics and trade source estimates.

products both for retrofitting and for installation on new domestically produced machines. American producers of digital readouts can anticipate increased sales of their products to Swedish industry for at least the next 5 years.

Retab is the most important domestic producer of digital readouts, and the company installs and services its own systems. AB C.E. Johansson, Sweden's most important manufacturer of instruments, makes digital readouts in combination with its other measuring systems.

Foreign suppliers of numerical controls include Plessey Co. and Ferranti, in the United Kingdom; the Japanese firm, Sony; and the Dutch company, Philips.

Boring machines.—The Swedish market for boring machines is expected to grow at a 4.4% average annual rate, rising from \$13.5 million in 1974 to \$16 million in 1978. Imports amounted to \$8.6 million in 1972 and are projected to exceed \$13 million in 1978. Purchases of boring machines from the United States in 1972 were valued at \$1.2 million, or about 14% of that year's import market. Sales of American equipment are expected to increase with the overall growth in demand for boring machines. The following types should be highly salable:

- Horizontal boring-drilling-milling-machines
 - floor type
 - table type
- Jig boring machines
- Numerically controlled boring machines

U.S. firms face little domestic competition for heavy-duty boring machines. One Swedish company, AB Torshallamaskiner, produces a boring-milling machine but it is not suitable for heavy-duty operations. European exporters of boring-drilling-milling machines include the German firms, Schiess AG and Wotan, and the U.K. subsidiary of DeVlieg. Giddings & Lewis and Gray are among the leading American suppliers.

Perishable cutting tools.—Swedish purchases of perishable cutting tools are expected to reach \$48 million in 1978, reflecting a 6% average yearly

increase over the \$38 million recorded in 1974. American manufacturers should find the market highly receptive at this time to new suppliers, especially to those which offer combined packages of cutting tools. Imports from the United States in 1972 amounted to almost \$1 million out of a total import market valued at \$7.9 million. The following types of cutting tools are anticipated to be particularly salable in Sweden:

- Band saw blades
- Boring bars
- Drills
- Abrasive belts
- Grinding wheels
- Milling cutters
- Taps

The United States, Sweden's leading foreign supplier of band saw blades, provided \$273,000 of \$411,000 in total imports in 1972. Imports of boring bars and tools amounted to \$1.7 million in 1972, of which U.S. exporters supplied \$62,000.

Domestic production of tools was estimated at \$42.6 million in 1972 and is expected to reach \$65 million in 1978. The most important local manufacturers are Malcus Holmquist, Wedevags Bruks AB, Wasstroms AB, Skandinaviska Vertygsfabriken, Sandviken AB, and Fagersta AB.

Significant European suppliers of taps include three German companies, Unisto, Rheime, and Umuge. Dormer of Great Britain and D-C of Switzerland also sell taps to Sweden. Major exporters of boring tools are Dormer, Cleveland (another British company), and Unisto. Unisto and the German firm, Prothothype Werke, supply milling tools. East European firms, which often sell tools with their machines, are becoming increasingly competitive.

Gear cutting machines.—The market for gear cutting machines in Sweden is projected to increase from \$3 million in 1972 to over \$5 million in 1978. Imports in 1978 are expected to top \$5 million, up from \$2.6 million in 1972. Purchases of gear cutting machines imported from the United States amounted to \$612,000 in 1972. U.S.-made gear

cutting machines, particularly machines for the automotive industry, have achieved a good reputation in Sweden and sales should increase in the foreseeable future.

Swedish production of gear cutting machines is limited to one company, C.O. Oberg & Co. AB. European competition is primarily from Germany and Great Britain. German suppliers include Klingelbug, Schiess AG, Hermann Pfauter, and Wanderer-Werke AG. Churchill Gear and Herbert-Fellows export gear cutting machines from the United Kingdom. The most active U.S. firms in this market have been Barber-Coleman, Cleveland, Fellows, and Michigan Tool Company.

Other sales opportunities.—American exporters of a number of other types of metalworking equipment can expect good sales opportunities in Sweden. The United States, one of Sweden's most important suppliers of automatic lathes, provided better than 12%, or over \$1 million, of that \$8-million import market in 1972.

Special-purpose grinding machines should be another highly marketable item for American manufacturers. The total import market for grinding and polishing machines was valued at \$7.9 million in 1972; of this, the United States supplied \$1.1 million.

Swedish manufacturers are interested in buying thread producing machines, transfer machines, presses, and drilling machines from U.S. companies. American-made metal parts cleaning and finishing equipment, spark erosion ultrasonic and electrolytic machines, and accessories for machine tools should also be in demand.

About 300 electrical discharge machines (EDM) have been sold by the Swiss company, AGIE. Some interest also has been expressed in electromechanical machining equipment (ECM). Sales will be limited, however, until the cost of reducing the pollution caused by the ECM process can be lowered.

End-User Industries

There were 4,747 manufacturers utilizing metalworking and finishing equipment in Sweden as of 1971 (see table 3). Their combined capital expenditures are projected to reach over \$590 million in 1978, an anticipated increase of over 20% over \$563 million in 1974 (see table 4). Total shipments, valued at \$10.8 billion in 1970, should reach \$13 billion in 1978.

Sweden's engineering industry,¹ which included 4,546 firms in 1971, will be making substantial purchases of automated machinery over the next

¹ The "engineering industry" in Sweden includes all end-users of metalworking and finishing equipment except those which process basic metals, i.e., iron and steel work, ferroalloys plants, and nonferrous metal works.

several years. With productivity expected to grow by 8% annually and the number of workers projected to remain the same or decline slightly, manufacturers will need advanced, labor-saving machinery in order to remain competitive.

Tax credits equal to 20% of purchases of new machinery were granted by the Swedish Government through July 1, 1973 and many industries stepped up purchases appreciably during 1972 to take advantage of this policy. Following this sharp rise, capital expenditures are expected to either level off or decline somewhat between 1974 and 1976. They should begin climbing again by 1977 or 1978, however, and are projected to reach almost \$600 million by the latter year.

The Swedish Government offers some limited support to industries that use metalworking equipment, mainly through its programs for regional development. Grants are given for capital investment, particularly in the northern part of the country, to stimulate economic growth in that area.

Major end-user firms and prospective customers in Sweden for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—Sweden*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Transport industry.—The transport industry, which consisted of 417 manufacturers of cars, trucks, bicycles, buses, motorcycles, and trains in 1971, is one of the fastest growing industries within the Swedish economy. Due to the government's tax credit policy, capital expenditures were unusually high in 1972. They were valued at \$127 million, of which \$75 million represented purchases of new machinery and equipment. Annual investment dipped to an estimated \$100 million in 1974 and is expected to rise to \$120 million in 1978.

Sweden's automobile sector, with 14 firms employing 21,700 workers in 1970, had an output valued at \$807 million in the same year. The rate of investment by car manufacturers is expected to outstrip that of the transport industry as a whole. The country's two most important producers of automobiles, Saab Scania AB and AB Volvo, have recently reorganized their traditional assembly lines.

Instead of a conventional assembly-line operation, employees now work in groups, each of which produces a finished product. Both companies are also trying to meet stringent noise and air pollution control standards in their production processes. The restructuring of operations and the antipollution measures will be important considerations in the companies' decisions on new machinery purchases. In general, the automotive sector will require gear cutting machines, presses, and transfer units for presses over the next several years.

Electrical machinery and equipment.—There were 455 companies in Sweden's electrical machinery and equipment industry in 1971. These firms produce a wide range of products, including telecommunications equipment, electrical generating machinery, and electrical appliances. Output was valued at \$1.3 billion in that year and is expected to grow by about 9% a year through 1978. Capital expenditures exceeded \$95 million in 1972. Of this total, \$65 million was spent for new machinery. Investment is expected to decline over the next several years, and in 1978 the capital outlay should be about \$88 million.

The industry is expected to have particularly high demand for the following types of metalworking equipment in the near future:

- NC machining centers
- Boring machines
- Grinding machines
- Punching and shearing machines
- Presses
- Cleaning and finishing equipment for sheet metal

The last three items will be needed primarily by the country's manufacturers of telecommunications equipment. Telefon AB L.M. Ericsson, the country's leader in the communications field, is expected to increase production by 8% a year and investments by 5% annually through 1978.

Allmanna Svenska Elektriska AB (ASEA) is the dominant producer of heavy electrical machinery. Its output includes generators, transformers, and various types of motors. ASEA has developed its own numerical control system and owns about 20% of all the NC machinery in Sweden.

Shipyards, shipbuilding industry.—The Swedish shipbuilding industry has experienced rapid growth in recent years; output expanded from \$506 million in 1965 to \$2.6 billion in 1971. Its production is forecast to rise almost 10% a year through the remainder of the 1970's.

The industry's capital outlays in 1972 totaled \$44.4 million, 50% of which was for new machinery. Capital expenditures have risen sharply from a base of only \$7 million in 1970. They are expected to level off at about \$29 million in 1974 and \$30 million in 1978.

Sweden's shipbuilding industry faces a continuous shortage of labor. Most of its new machinery purchases therefore will be automated production equipment. Shipbuilders in particular are expected to sharply accelerate their purchases of numerically controlled heavy-duty boring machines and drilling machines.

Nonelectrical machinery industry.—Sweden's production of nonelectrical machinery was valued at \$2.4 billion in 1971 and is expected to increase at a 4.5% annual rate through 1978. Firms stepped up capital expenditures in 1972 to maximize the benefits of the Government's tax policy and devoted \$94 million (out of a total of \$137 million) to new machinery purchases. The estimated 1974 level of capital outlays is \$100 million; a moderate decline is expected to bring the 1978 total to \$98 million.

Manufacturers of heavy machinery are interested in purchasing a wide range of advanced metalworking equipment, including all types of numerically controlled machines. Many firms are also expected to acquire heavy duty boring machines and machining centers.

Sweden's nonelectrical machinery industry is highly competitive in the world market. Approximately 40% of total output is currently exported

Table 3.—Sweden: End-users of metalworking and finishing equipment, 1971

Sector	No. of manu- facturers	Value of shipments (in millions U.S. dollars)	Value of capital expenditures (in millions U.S. dollars)	No. of workers ¹
Iron & steel works.....	34	1,200	92	123,640
Ferroalloy plants, iron & steel foundries	79	200	9	
Nonferrous metal works.....	88	500	13	10,478
Metal wares.....	1,934	1,500	61	83,097
Nonelectrical machinery	1,302	2,400	94	128,406
Electrical machinery and equipment	455	1,300	58	71,407
Instruments.....	131	100	3	8,404
Shipyards, ship- building	136	2,600	12	102,562
Other transporta- tion equipment	417	1,900	91	73,737
Other industries	171	100	2	5,869

¹ 1970 data.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics.

and some of the most important companies—AB Svenska Kullagerfabriken (SKF), AB Electrolux, Atlas Copco AB, Alfa-Laval AB, and Sandvik AB—are exporting between 70 and 95% of their total sales.

Metalwares industry.—The metalwares industry comprised 1,934 firms in 1971. Its production, valued at \$1.5 billion in that year, should increase by 3% a year for the next several years. Output includes household products and industrial formed metal products.

Capital expenditures totaled \$110.5 million in 1972; \$73 million of this amount went toward the purchase of new equipment. Outlays were an estimated \$79 million in 1974 and are projected to decline to \$76 million in 1978. Sweden's metalwares industry must accelerate its use of automated, laborsaving machinery if its products are to meet the competition from those produced in countries with lower wage scales. Therefore, although the level of investment is decreasing, advanced metalworking equipment is expected to account for a higher percentage of the new machinery purchases. American manufacturers can anticipate good sales potential for the following machines:

- Numerically controlled machines
- Lathes
- Boring machines
- Milling machines
- Tools for machine tools

Domestic Manufacture of Metalworking Equipment

Swedish production of metalworking equipment amounted to \$129.7 million in 1972 and is expected to approach \$230 million in 1978. There are approximately 40 companies, with an aggregate of 4,000 employees, engaged in the manufacture of metalworking machinery in the country.

Swedish manufacturers are generally most competitive in the production of conventional machinery and machinery for which Sweden has special safety regulations. Their major products are milling machines, grinding machines, punches, presses, and shearing machines.

Ten of the domestic manufacturers produce the more sophisticated machinery. SMT (Swedish Machine Tools) Machine Company AB, is one of the largest of the 10 and is a government-owned firm. Its 1973 output was an estimated \$12 million. SMT manufactures equipment with moderately advanced mechanical construction. Its NC lathes, however, are considered to be highly competitive, and the company plans to increase production of these.

Table 4.—Sweden: Capital expenditures of end-users of metalworking and finishing equipment, 1970, 1974, and 1978

(in millions of U.S. dollars)

Sector	1970	1974	1978
1. Iron and steel works	99	131	133
2. Nonelectrical machinery industry	77	100	98
3. Other transportation equipment industry	61	100	120
4. Metal wares industry	51	79	76
5. Electrical machinery and equipment industry	47	84	88
6. Nonferrous metal works	21	22	26
7. Ferro-alloy plants, iron and steel foundries	9	11	13
8. Shipyards, shipbuilding	7	29	30
9. Manufacturing of instruments	3	4	4
10. Other industries	3	3	3
Total	378	563	591

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official trade statistics and trade source estimates.

Sandens Mekaniska Verkstad AB is Sweden's largest producer of milling machines, both the knee type and numerically controlled machines. The company exports more than 50% of its output, which reached an estimated \$6 million in 1973. Another large firm, Lidkopings Mekaniska Verkstads AB, manufactures grinding machines and centerless grinders and realized \$15 million in production value in 1973. Ulvsunda Verkstader AB, a subsidiary of Bofors AB, also specializes in grinding machines.

Other large metalworking machinery manufacturers include AB Pullmax and AB Arboga Maskiner, each of which had production valued at \$3 million in 1973. The former company mostly fabricates drilling machines, while the latter specializes in making punching machines. AB Carbox, a government-owned company, is in the process of introducing a new type of press.

The Swedish industry sells roughly 50% of its output abroad. Exports are projected to top \$150 million in 1978. West Germany has become the major country of destination for Swedish machine tools in the last few years, but the Nordic countries also remain significant markets.

Trade Regulations and Practices

Sweden's import duties on metalworking and finishing equipment are normally 5% of the cost, insurance, and freight (c.i.f.) value. A number of items that do not compete with domestically-produced goods can enter free of duty. Information concerning official duty rates applicable to specific products within the product category may be ob-

tained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4127, Main Commerce Building, Washington, D.C. 20230. A value-added tax of 17.65% is applied to all goods and services sold in Sweden.

Sales agents are the most important channel of distribution of machine tools in Sweden. It is estimated that agents supply about 80% of all imported machine tools and about 60% of the total market. They maintain stocks, spares, and service facilities for all types of equipment except numerically controlled or special-purpose machines. Distributors in Sweden only sell general-purpose or standard machines and do not maintain stocks, spares, or service facilities. They supply an estimated 15 to 20% of the total market. There are only a few foreign companies with direct sales organizations in Sweden.

Equipment is usually installed by the agent or by the manufacturer of the machine. The manufacturer will generally install advanced machinery as well as take care of training and startup. Service and maintenance contracts are becoming increasingly popular.

Technical Requirements

Although there are no official regulatory organizations for the use of metalworking equipment in Sweden, the National Board of Occupational Safety and Health has issued special requirements for

some machine tools, especially presses and shearing machines. The Swedish Association for the Engineering Industry (Sveriges Mekanförbund) and the four largest end-users of metalworking and finishing equipment have issued an unofficial standardization test, called BAS. This test, however, is not commonly used by small and medium-size companies.

The characteristics of Sweden's electrical power supply system are 220/380 volts, 50 hertz, 3-phase.

While the English system of weights and measurements is still acceptable in general, the introduction of ISO (International Standards Organization) standards in Sweden is nearly completed, and the metric system will be the only one acceptable to Swedish end-users in the future. Published national standards for metalworking and finishing equipment in Sweden may be obtained through the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230: "The Market for Metalworking and Finishing Equipment in Sweden," DIB 74-07-505, January 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Sweden. The table gives the value in U.S. dollars of various items of metalworking equipment imported by Sweden in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Sweden: Imports of metalworking equipment 1968-78, alternate years

(in millions of U.S. dollars)

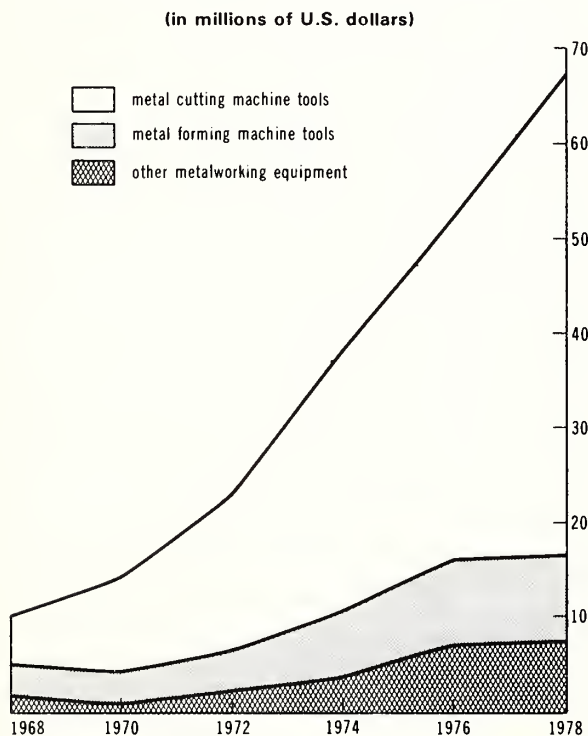
Type of Equipment	1968	1970	1972	1974	1976	1978
<i>Metal cutting machine tools:</i>						
Gear cutting machines.....	.740	2.618	2.608	4.277	4.747	5.222
Automatic lathes.....	4.091	8.413	8.035	11.359	13.063	15.023
Other lathes.....	4.070	7.423	6.486	8.803	10.123	11.135
Planing machines.....	.187	.354	.108	.135	.142	.149
Boring machines.....	4.253	5.071	8.561	11.135	12.248	13.473
Milling machines.....	4.413	5.391	7.401	10.044	11.551	13.283
Grinding and polishing machines.....	4.154	5.560	7.877	9.708	11.068	12.465
Broaching machines.....	n.a.	.112	.036	.039	.037	.035
Hammers and rammers.....	n.a.	.284	.147	.174	.180	.185
Shears and nibbling machines.....	n.a.	2.631	3.079	3.586	3.694	3.805
Other.....	n.a.	6.771	5.426	7.258	8.126	9.402
Total.....	21.908	44.628	49.764	66.518	74.979	84.177
<i>Metal forming machine tools:</i>						
Punching machines and presses.....	4.332	9.111	7.434	9.248	9.988	10.687
Total.....	4.332	9.111	7.434	9.248	9.988	10.687
<i>Other metalworking equipment:</i>						
Other machines.....	n.a.	5.344	7.692	9.744	10.523	11.365
Total.....	n.a.	5.344	7.692	9.744	10.523	11.365
<i>Machine tool parts, accessories, tools and dies:</i>						
Vises.....	.069	.159	.184	.223	.236	.251
Chucks.....	.381	.761	.776	.921	.968	1.016
Band saw blades.....	.580	.522	.411	.479	.469	.460
Saw blades for circular saws.....	.196	.373	.443	.526	.558	.591
Boring bars and tools.....	.720	1.616	1.692	2.047	2.170	2.300
Thread tools.....	.526	1.035	1.343	1.702	1.838	1.985
Tools for milling & broaching mach. ....	.927	1.703	2.391	2.974	3.182	3.437
Rotating files (carbide).....	.032	.081	.052	.063	.066	.069
Other rotating files.....	.038	.068	.046	.062	.065	.069
Other files.....	.014	.022	.020	.024	.025	.026
Carbide tools (lathes).....	.095	.146	.569	.709	.751	.804
Tools-bits and others.....	.074	.331	.513	.667	.734	.807
Dies drawing.....	.056	.054	.056	.071	.071	.071
Other accessories for machine tools.....	1.025	2.094	2.562	3.071	3.286	3.516
Other parts.....	4.055	7.267	8.221	9.949	10.546	11.179
Others.....	.347	.398	.329	.395	.406	.419
Total.....	9.135	16.630	19.609	23.884	25.371	27.000
Total metalworking equipment.....	n.a.	75.713	84.499	109.394	120.861	133.229

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Swedish official trade statistics and trade source estimates.

Republic of China on Taiwan

Taiwan's booming economy continues to show great vitality. The gross national product (GNP) rose to \$9.4 billion in 1973, a 22.1% gain over the preceding year.¹ Efforts to diversify and strengthen the island's industrial complex should help push the GNP to \$14 billion in 1978. Sizable new public and private projects are now underway, particularly in petrochemical and heavy industries. The Government alone initiated over 25 major undertakings in 1973 to expand power supply units, harbor facilities, and chemical processing plants.

Figure 1.--Taiwan: Consumption of metalworking equipment, 1968-78, alternate years



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Taiwan trade source estimates.

Business confidence is reflected in the level of capital investment, which grew from \$1.5 billion to \$2.5 billion during the 1970-73 period. Capital investment is projected to rise by 13.5% a year from 1974 to 1978, increasing from \$2.7 billion to almost \$4.5 billion over the 4-year period.

The development of heavy and basic industry in Taiwan will undoubtedly provide a strong boost to the market for metalworking and finishing equipment (MFE). Consumption of metalworking equipment in 1978 is projected at \$67 million, representing a better than 15% annual rise over the estimated 1974 level of \$38 million (see table 1). Substantial growth of the market for metal finishing equipment is also anticipated, but statistics on it are not available. The discussion in this report therefore will be limited primarily to the market for metalworking equipment.

The age of metalworking and finishing equipment currently in use is indicative of the progress of Taiwan's young industrial complex. Approximately 66% of the machine tools have been purchased since 1964, and about 44% are less than 5 years old.

The trend toward utilizing the latest machinery available should have considerable impact on the market for metal cutting machine tools. Purchases are projected to climb by almost 17% a year during the 1974-78 period, boosting the market from \$27.4 million to over \$51 million. Imports, which accounted for 47% of a \$16.7-million market in 1972, are expected to approach \$26 million in 1978. Tai-

¹ In order to present a more accurate picture, growth rates have been calculated from local currency values. This eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	NT/US\$1
1968-72	40.1
1973-78	38.0

wan's production and exports of metal cutting machine tools are both expected to expand appreciably. By 1978, local output should exceed \$54 million, of which about \$9 million will probably be exported; domestic production in 1972 was valued at only \$13.2 million and exports were \$4.3 million.

Consumption of metal forming machine tools is expected to nearly double, going from \$4.2 million in 1972 to more than \$8 million in 1978. Imports should approach \$9.5 million in 1978, up from \$2.9 million in 1972 and \$5.4 million in 1974. Taiwan's manufacturers are gearing up to increase output of metal forming equipment, and production should exceed \$8 million in 1978, reflecting a 25% average annual increase over 1974. Exports are projected to rise dramatically, from only \$1.9 million in 1974 to over \$9.6 million in 1978.

The market for other metalworking equipment is expected to expand from \$2 million in 1972 to approximately \$7.7 million in 1978. Imports provided 17% of the 1972 market and should top \$1 million in 1978.

In spite of the expansion in domestic output of

metalworking equipment, imports are expected to fill an increasing proportion of the country's total demand (see Appendix). Taiwan imported almost 50% of its required machine tools in 1972, and in 1974 this proportion rose to 54%. Purchases of metalworking equipment from abroad are expected to advance by about 15% annually during the 1974-78 period, increasing from roughly \$20.7 million to over \$36 million.

Purchases of American-made metalworking machines in 1972 were valued at \$1.1 million, or nearly 10% of the import market (see table 2). This proportion should rise to at least 16% in 1976 as industrialists rely more heavily on U.S. suppliers to fill their requirements for increasingly sophisticated equipment.

Taiwan's manufacturers are expected to favor American suppliers now that the country has imposed restrictions on imports from Japan for political reasons. Japan was the country's leading foreign supplier of machine tools in 1972, when it held a 57% share of the import market. Germany was the only other country with a strong competitive position in the market. Imports from German manufacturers in 1972 amounted to \$1.9 million, or a 17% market share.

American suppliers provided about 11% (\$890,000) of Taiwan's 1972 import market for metal cutting machines. Despite stiff competition from Japanese and German manufacturers—they provided 58% and 13% of this market, respectively, in

Table 1.—Taiwan: Consumption¹ of metalworking equipment, 1968, 1972, 1974, and 1978
(in millions of U.S. dollars)

Year	Metal cutting machine tools	Metal forming machine tools	Other	Total
1968				
Production	3.20	0.96	0.51	4.67
Imports	2.63	2.24	1.25	6.12
Exports .....	.89	.08	.06	1.03
Consumption	4.94	3.12	1.70	9.76
1972				
Production	13.17	2.13	1.83	17.13
Imports	7.90	2.88	.35	11.13
Exports	4.33	.80	.18	5.31
Consumption	16.74	4.21	2.00	22.95
1974				
Production	22.78	3.55	3.26	29.59
Imports	14.67	5.37	.62	20.66
Exports	10.06	1.86	.33	12.25
Consumption	27.39	7.06	3.55	38.00
1978				
Production	54.17	8.44	7.74	70.35
Imports	25.84	9.46	1.09	36.39
Exports	29.00	9.63	1.08	39.71
Consumption	51.01	8.27	7.75	67.03

¹ Consumption equals production plus imports minus exports.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Taiwan official trade statistics and trade source estimates.

1972—the United States is expected to supply more than 15% in 1976. Though the United States had only a small segment of the 1972 import market for metal forming machine tools, the increased demand for American equipment should push the U.S. share in 1976 to at least 8%, and marketing techniques could further expand American penetration of this market. Imports of metal forming equipment from Japan amounted to \$1.8 million in 1972 and those from Germany amounted to \$770,000.

Sales Opportunities

A market research study recently conducted in Taiwan for the United States Department of Commerce, Office of International Marketing, identifies specific segments of the Taiwan market for metalworking equipment that offer the best sales opportunities for U.S. suppliers. The information is based primarily on interviews with trade experts, analysis of imports, and responses from questionnaires mailed to Taiwan's major end-users of machine tools.

Lathes.—The Taiwan market for lathes was valued at \$12.3 million in 1972 and may exceed \$40 million in 1978. Approximately \$2.4 million worth of the lathes purchased in 1972 were imported. Imports are anticipated to supply about 18% of the total lathe market in 1978.

Local production of lathes amounted to \$12 million in 1972 and should top \$48 million in 1978. Some 24 firms are making lathes in Taiwan, the most significant of which are Yang Iron Works Co., Ltd.; Taichung Machinery Works Co., Ltd.; Lian Feng Machine Co.; San Yuen Machine Tool Co., Ltd. and King Iron Works. Japan was the largest foreign supplier of lathes in 1972, claiming a 75% share of the import market. American and German firms ranked second that year, each accounting for 11% (\$270,000) of imports.

Although local manufacturers are expected to quadruple production of lathes between 1972 and 1978, Taiwan will continue to rely on foreign suppliers for automatic, high-precision, and heavy-duty models, which are not available locally. U.S. ex-

Taiwan—Age of metalworking and finishing equipment currently in use

Age of equipment	Percent
Less than 5 years old	44
6 to 10 years old	22
11 to 15 years old	15
over 15 years old	19
Total	100

porters can anticipate increased demand for the following types of equipment for the next several years:

- Heavy duty lathes
- Tracer lathes
- Semiautomatic lathes
- Numerically controlled turret lathes
- Threading lathes
- Railroad car wheel lathes
- Watchmaker's lathes
- Toolroom lathes

Milling machines.—Purchases of milling machines are expected to more than triple from 1972 to 1978, rising from about \$1.2 million to almost \$4 million.

Imports satisfied nearly all the domestic demand in 1972, accounting for \$1.18 million of that year's market. Purchases of foreign-made milling machines in 1978 are expected to exceed \$3.8 million.

A few local manufacturers produce vertical, horizontal plain and universal milling machines, but their production is quite limited. The companies include Dah Lih Machinery Industry, Da Shin Machinery Co. Ltd., New Douglas Machine Works, and Ta Shing Machine Works Ltd.

American exporters are in a position to expand sales here because of the shortage of local production facilities and the increasing need for precision milling machines. Although Japanese and German manufacturers offer some competition in milling machines, U.S. suppliers command a wide lead in this market because of the accuracy and quality of their equipment. Machinery of highest sales potential includes the following:

Table 2.—Taiwan: Imports of metalworking equipment from selected countries, 1972

Equipment	U.S.	The Netherlands	Japan	Germany	U.K.	Other	Total
Metal cutting machine tools	0.89	4.61	1.03	0.26	0.17	0.94	7.90
Metal forming machine tools ....	.15	1.79	.77	.04	.03	.10	2.88
Subtotal, metalworking machine tools	1.04	6.40	1.80	.30	.20	1.04	10.78
Other metalworking equipment .....	.10	.19	.05	—	—	.01	.35
Total	1.14	6.59	1.85	.30	.20	1.05	11.13

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official Taiwan trade statistics.

- Copy milling machines
- Diesinking milling machines
- Duplicating milling machines
- Turret-head milling machines
- Rotary-type milling machines
- Slot milling machines
- Keyway milling machines
- Plane milling machines
- Bed type milling machines
- Cam milling machines

Imports of universal tool milling machines should expand during the 1972-78 period from a modest \$80,000 to nearly \$300,000. Imports of profile milling machines are expected to more than double during the same years, reaching \$180,000 in 1978. Purchases of other milling machines from abroad are forecast to reach \$3.4 million in 1978, up from only \$1 million in 1972.

Grinding machines.—Taiwan is almost entirely dependent upon foreign supplies to meet its requirements for virtually all types of grinding machines. Imports, which totaled \$1.4 million in 1972, are projected to reach \$4.5 million in 1978.

Local production of grinding machines is minimal. There are only six companies fabricating surface, cylindrical, and universal tool and cutter grinding machines. Among these are the Tong Tai Machinery and Tool Co., Ltd.; Taichung Machinery Works Co., Ltd.; and the Affiliated Production Training Works of the Ming Chi Institute of Technology.

American exporters should be able to increase sales of grinding machines to Taiwan for two reasons: the lack of significant local production and the superior reputation of American manufacturers for high-performance equipment. Strong sales potential exists for the following machinery:

- Cylindrical grinding machines
 - external, angular wheelslide grinding machines
 - external, centerless grinding machines
 - external, plain grinding machines
 - external, plunge grinding machines
 - external, universal grinding machines
 - external, centerless grinding machines
 - internal, chucking horizontal grinding machines
 - internal, chucking vertical grinding machines
 - internal, plain grinding machines
 - roll grinding machines
- Copy grinding machines
- Thread grinding machines
- Surface grinding machines
 - reciprocating table, horizontal spindle grinding machines
 - rotary table, vertical spindle grinding machines
 - double disc grinding machines
- Tool and cutter grinding machines
 - carbide tip tool grinding machines
 - gear cutting tool grinding machines
 - hob sharpening grinding machines
 - twist drill grinding machines
 - universal tool and cutter grinding machines

Taiwan imported \$100,000 of cylindrical grinding machines in 1972, and projections for 1978 approach \$340,000. The import market for surface grinding machines in 1972 was \$330,000, and purchases should top \$1 million in 1978.

Boring machines.—Taiwan's 1972 imports of boring machines were valued at \$430,000 and are projected to reach \$1.4 million in 1978. As there is practically no local production of boring machines, increased demand for accurate and heavy-duty machines should prove advantageous to U.S. manufacturers. The only other major competitor in this market is Germany. Products with the greatest potential for American exporters appear to be the following:

- Cylinder boring machines
- Jig boring machines
- Horizontal boring drilling-milling machines
- Double-end boring machines
- Boring and facing machines

Horizontal and jig boring machines recorded the largest sales in 1972, when imports of these machines were valued at \$230,000 and \$50,000, respectively.

Gear shaping, cutting, hobbing, and finishing machines.—Consumption of this equipment was valued at \$280,000 in 1972 and should more than triple in the 1972-78 period, when purchases are forecast to reach \$880,000. As there is no significant local production, demand is almost entirely satisfied by foreign manufacturers. U.S. and German exporters are the major suppliers.

Taiwan's manufacturers plan to increase their production of gears in the near future and will need to import gear shaping, cutting, hobbing, and finishing machines to realize their goals. U.S. exporters of this machinery can anticipate strong sales potential for the following items:

- Gear forming machines
- Gear lapping machines
- Gear shaping machines
- Gear shaving machines
- Gear and spline hobbing machines
- Gear finishing machines

Other sales opportunities.—The Taiwan market for numerically controlled equipment is beginning to expand. Until recently, the low cost of labor and the relatively high cost of such sophisticated equipment combined to limit this market. Now, however, the development of capital-intensive industries such as shipbuilding and petrochemical manufacturing should boost demand for numerically controlled flame cutting machines and tape-controlled turret head drilling machines.

End users in Taiwan generally consider it too costly to retrofit their machine tools with numerical controls. Nevertheless, some manufacturers are interested in purchasing numerical controls to put on

Table 3.—Taiwan: Principal end users of metalworking and finishing equipment, 1969

Sector	No. of manufacturers	Value of sales (in millions of U.S. dollars)	Capital Expenditures
1. Motor vehicle manufacture and repair	754	54.15	70.30
2. Shipbuilding and repairing	262	24.38	54.78
3. Manufacture of agriculture implements	198	24.41	49.23
4. Manufacture of electrical apparatus	241	56.21	48.20
5. Miscellaneous machinery industries	1,541	38.13	32.04
6. Manufacture of prime movers	87	11.44	25.57
7. Manufacture and repair of agricultural machinery	307	10.81	17.93
8. Manufacture and repair of industrial machines	561	21.54	17.35
9. Manufacture and repair of machine tools	193	11.19	11.97
10. Manufacture of needles, nails, chains, springs, and metal sets	296	14.72	11.31
Total	4,440	266.98	338.68

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Taiwan official trade statistics.

machines for export. The Yang Iron Works Co. Ltd., for example, expressed an interest in importing tape control systems for use on lathes of their manufacture to be sold in the world market.

The outlook for sales of electrical discharge machines (EDM) and electrochemical machines (ECM) is good. Electrical discharge machines are currently being used in a number of factories. Some are manufactured in Taiwan on a made-to-order basis; most are imported from Japan. A market for electrochemical machines is just now emerging. The Titans Industrial Co. Ltd., a producer of carbide tools, was one of the first users of ECM machines in Taiwan.

End-User Industries

Taiwan's efforts to broaden its economic base have proceeded at a fast pace. From 1968 to 1969, the number of companies utilizing metalworking equipment increased by 33% to reach 8,000; their combined sales were up 13%, climbing to over \$565 million.

The principal end-users of machine tools on the island in 1969 comprised 4,400 firms, with shipments aggregating \$267 million (see table 3). Capital expenditures of these sectors totaled \$338.7 million in 1969 and are projected to increase by nearly 15% annually during the 1974-78 period, rising from an estimated \$593 million to over \$1 billion (see table 4).

The Republic of China (ROC) Government offers a variety of tax incentives to newly established enterprises, including those which use metalworking equipment. In addition, the Government aids private enterprises through the Metal Industries Development Center. The Center provides technical consultation services, workshops, management con-

sultation services, training programs, and library and exhibition services.

Major end-user firms and prospective customers in Taiwan for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, Metalworking and Finishing Equipment-Taiwan, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers the Trade List identifies principal potential agents and distributors, relevant local trade publications and trade associations.

Motor vehicle manufacture and repair.—The largest end-user of metalworking equipment in Taiwan is the motor vehicle industry, which produces motorized bicycles, motorcycles, automobiles, and truck chassis. Motorcycle and automobile manufacturers, which constitute the greatest portion of the sector, have experienced rapid growth during the past several years. Production of motorcycles grew from 74,734 units in 1966 to 143,913 in 1971; in the same years, the number of automobiles manufactured in Taiwan expanded from 3,294 to 11,703. The production value of automobiles reached \$29.4 million in 1971, and that of motorcycles exceeded \$49 million.

The strong growth potential of this sector is beginning to attract foreign investors. For example, the Ford Motor Company in 1973 acquired majority ownership of the Lio Ho Automobile Industrial Corporation, which produces sedans, light commercial cars, and automobile engines. This transaction has led to the procurement of over \$30 million of new machinery and equipment. Though most of

that equipment has already been purchased, imports of new machinery probably will continue through 1975.

The entire motor vehicle industry sector spent an estimated \$2 million on machine tools in 1972. Purchases should be slightly higher in 1974 and are projected to reach approximately \$4 million in 1978.

The motorcycle industry in particular is interested in accelerating investments in sophisticated, labor-saving machine tools. This industry enjoys a large and expanding market, both internationally and domestically. Manufacturers are interested in purchasing cylinder boring machines, drilling and tapping machines, gear and universal grinding equipment, profile milling machines, thread rolling machines, die spotting and automatic highspeed presses, and surface lapping machines.

Expansion of the automobile industry in Taiwan will depend on foreign demand, because the domestic market is apt to remain limited for some time. Companies are stepping up their purchases of machine tools in anticipation of a widening export market. The Yue Loong Motor Company Ltd., a major automobile producer with 1,700 workers, expressed interest in jig boring machines, cam and camshaft grinding machines, openside planers, brake drum lathes, and die spotting presses. Approximately 50% of the firm's machinery is less than 5 years old, 80% less than 16 years old. The company spent \$315,000 on metalworking and finishing equipment during 1973 and planned to purchase \$798,000 worth in 1974.

Although Taiwan's manufacturers of motorcycles and automobiles have had access to the latest technology through licensing agreements with foreign firms, they have preferred handmade production because of the low wage costs in Taiwan. This situation is expected to change as labor costs increase

and the industry finds that manual operations cannot meet production demands.

Shipbuilding and repairing.—Taiwan's shipbuilding and repairing sector has expanded rapidly, the value of shipments growing from \$24.3 million in 1969 to nearly \$80 million in 1974. Annual sales in 1978 are expected to exceed \$400 million. Capital expenditures are forecast to rise from \$210 million to \$290 million during the 1974-78 period.

Since the industry is striving for shorter production schedules, future investments will include purchases of high-performance cutting and welding equipment used in the fabrication of large steel plates. Lathes and milling machines are also of interest to Taiwan's shipbuilders.

It was announced in December 1973 that the China Shipbuilding Corporation and the American firm, Gatex Oswego Corporation, would construct four 450,000-ton tankers. The first of the tankers, valued at \$70 million, is scheduled for delivery by November 1977.

The China Shipbuilding Corporation was inaugurated in July 1973 with 55% ownership by the ROC Government, 25% by Gatex Oswego, and the remainder by other foreign interests. It has a total capital of \$27.8 million. The firm is now building a shipyard in southern Taiwan that will have a shipbuilding capacity of 1.4 million tons annually and a repair capacity of 2.5 million tons per year. The other major shipbuilding company is Taiwan Shipbuilding Corporation, with a production capacity of 300,000 tons a year.

Manufacture of agricultural implements.—Taiwan's manufacturers of agricultural implements produce a wide range of products, including harvesting machines, tractors, power tillers, and pumps. These firms have experienced rapid growth during the past several years, largely due to the Government's emphasis on raising agricultural output

*Table 4.—Taiwan: Capital expenditures of principal end users of metalworking and finishing equipment
1969, 1974 and 1978
(in millions of U.S. dollars)*

Sector	1969	1974	1978
1. Manufacture and repair of motor vehicles	70.30	52.63	92.10
2. Shipbuilding and repairing	54.78	210.00	289.47
3. Manufacture of agricultural implements	49.23	26.32	78.94
4. Manufacture of electrical apparatus	48.20	131.57	315.79
5. Miscellaneous machinery industries	32.04	444.73	78.94
6. Manufacture of prime movers	25.57	36.84	44.74
7. Manufacture and repair of agricultural machinery	17.93	13.15	15.79
8. Manufacture and repair of industrial machinery	17.35	22.37	31.57
9. Manufacture and repair of machine tools	11.97	31.57	52.63
10. Manufacture of needles, nails, chains, springs, and metal sets	11.31	23.68	26.32
Total	338.68	592.86	1,026.29

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Taiwan official trade statistics and trade source estimates.

in the face of a shrinking farm labor force. Farmers have had to use more machinery to meet the higher production goals.

The rise of a food processing industry which began in 1968 has also given impetus to the use of more mechanized agricultural equipment. Between 1968 and 1970, the country's production value of canned citrus fruit grew by 65%, that of jam and other canned fruits increased by 56%.

The sector responded to the rising demand for its products by accelerating capital equipment purchases from only \$620,000 in 1968 to nearly \$50 million in 1969. Although the level of capital expenditures dropped to an estimated \$26 million in 1974, it is expected to rally and reach almost \$79 million in 1978. Purchases of metalworking equipment, approximating \$900,000 in 1972, are projected to increase by about 8% annually from 1974 to 1978. The following types of machine tools will be of particular interest to manufacturers of agricultural implements:

- Profile and jig machines
- Pantograph milling machines
- Cold headers
- Mechanical forging presses
- Drop hammers
- Friction screw presses

Manufacture of electrical appliances.—The steady growth experienced by Taiwan's manufacturers of electrical appliances during the past few years should continue through 1978. From 1969 to 1974, capital expenditures by this sector increased from \$48 million to over \$131 million, and 1978 investments are projected to reach almost \$316 million. Annual shipments grew from \$56 million to \$187 million during the 1969-74 period and are forecast to reach \$344 million in 1978.

Many varieties of appliances (e.g., electric fans, air conditioners, and refrigerators) are produced in Taiwan. This industry sector is developing at a phenomenal rate: the number of electric fans assembled increased from 425,307 units in 1970 to more than five times that number (2,259,592 units valued at \$5.5 million) the following year. Output in 1971 also included 19,490 air conditioners, valued at \$11.5 million, and 182,318 refrigerators, valued at \$43 million.

The largest company in the industry is the Tatung Engineering Company, with 10,000 employees. This firm is Taiwan's major producer of refrigerators, air conditioners, washing machines, electric fans, automatic rice cookers, televisions, stereophonographs, meters, telephones, and many other consumer items. Tatung purchases some metalworking and finishing equipment from local and foreign suppliers. It also maintains its own shop for in-house production of high-speed saws, filing, die casting machines and squaring shears, friction screw presses, power

presses, surface grinding machines, and various types of industrial furnaces. The Tatung Company spent \$315,000 on metalworking equipment in 1973 and an estimated \$1.3 million during 1974.

With a few exceptions (such as the Tatung Company) manufacturers of electrical appliances utilize automatic machines only when part standardization dictates the necessity for such automation. Tracer controls are used on special precision dies and for mold construction but not in the production lines. Metal parts are tooled individually by workers using automatic lathes and other machine tools and, in some cases, hand-operated tools.

Miscellaneous machinery industries.—Taiwan manufacturers produce a wide range of machinery, including textile, woodworking, sugar-making, food and rubber processing machinery; air compressors; engines; and conveying facilities. Combined sales of the manufacturers of these products reached \$40.2 million in 1969, more than double the \$19.2-million level of the preceding year. Capital expenditures also doubled during the same period, rising from \$15.5 million to over \$32 million. From 1974 to 1978, the sector's capital expenditures are expected to increase by over 15% a year, rising from \$44.7 million to nearly \$79 million. Purchases of metalworking equipment are projected to climb from \$1.9 million in 1974 to more than \$3 million in 1978.

The above industries are interested in the following types of machine tools:

- Gear cutting machines
- Milling machines
- Double-end and facing machines
- Horizontal boring machines
- Double column vertical boring machines
- Multispindle drilling machines
- Numerically controlled drilling machines
- Gear grinding and finishing machines
- Dies and tools for machine tools
- Hardness testing equipment
- Metal parts cleaning and finishing equipment
- Forging presses

Two firms are fairly representative of the level of technology and types of machinery utilized in this sector. The first is the Ming Da Industrial Co., which employs some 200 persons to produce machines for cutting paper, leather, and rubber. Sixty percent of its metalworking and finishing equipment is less than 5 years old. Ming Da spent \$189,000 on metalworking and finishing equipment in 1973, and expenditures in 1974 are estimated to have doubled. The firm is especially interested in purchasing gear cutting and milling machines for expediting and improving production processes.

A second typical enterprise in the sector is the Fu Sheng Industrial Co., which manufactures air compressors and employs 200 people. Its machinery is less than 10 years old. Fu Sheng spent \$131,000 on metalworking and finishing equipment in 1973

and twice that amount in 1974. The company expressed particular interest in double-end and facing equipment, horizontal boring machines, double-column vertical boring machines, mulit spindle drilling machines, numerically controlled drilling machines, gear grinding and finishing machines, and a variety of other types of grinding machines. Most assembly operations are now done manually but, with order backlogs increasing, management has decided to purchase high-performance assembly machinery capable of greater output and accuracy than current production methods permit.

Domestic Manufacture of Metalworking and Finishing Equipment

The 1969 Taiwan Industrial Census showed that approximately 193 enterprises with a total of over 4,000 workers were engaged in the manufacture and repair of machine tools and had revenue totaling \$11.9 million. Domestic manufacturers of metalworking and finishing equipment are primarily small firms employing an average of 22 workers per factory.

Taiwan's 1972 production of metalworking equipment was valued at \$17.1 million, of which \$5.3 million was sold abroad. Domestic output (minus exports) accounted for slightly over half of that year's total consumption of machine tools. It is projected to reach \$70 million in 1978 and to account for 46% of Taiwan's metalworking equipment market in that year. Local manufacturers are expected to supply a declining share of the island's needs because of the anticipated expansion of foreign markets for their products. Exports, which consist main-

ly of lathes, drilling machines, and parts for machine tools, should amount to nearly \$40 million in 1978.

New orders for machine tools grew by 87% from 1972 to 1974, going from a value of \$30 million to \$56 million. New orders are expected to rise steadily for the next 5 years. The backlog of orders held by domestic manufacturers in 1972 consisted of approximately 36% of the total production for that year. Because domestic production of metalworking equipment is increasing at a rapid pace, backlogs are anticipated to drop to about 27% of production by 1978.

Lathe production constituted 69% of domestic output in 1972. There are 24 lathe manufacturers and the largest of these, Yang Iron Works Co., Ltd., employs 210 workers. Twenty-five factories produce drilling machines; six produce presses. In 1972, an estimated 14,000 engine lathes, 21,000 drilling machines, 15,000 presses, and 3,200 other machine tools were produced. The only important subsidiary of a foreign concern is the Taiwan Takisawa Company, a Japanese-owned firm producing lathes which it sells on the local market and exports to Japan. Other Japanese firms have small-scale investments in tool, bit, and die factories. An Australian-owned company, Titan (Taiwan) Pty., Ltd., manufactures dies. Licensing and technical agreements are not in wide use in the industry at present.

Trade Regulations and Practices

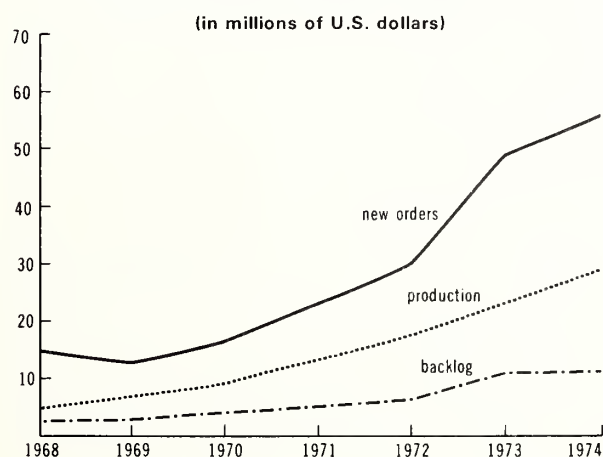
Taiwan imposes moderate tariffs on imported metalworking equipment. Duties are 7½% for machine tools and parts (lathes, planers, drill presses, boring machines) and 15% for machine shop tools and files (cutters, drills, reamers, pneumatic and electrically operated tools), and hand tools and implements.

Information concerning official duty rates applicable to specific products within the product category, may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Room 4127, Main Commerce Building, Washington, D.C. 20230.

The strength of the Taiwan economy, coupled with a favorable balance of payments and substantial foreign currency reserves, leaves no question as to the availability of capital for financing of imported equipment. Interest rates are high, however. They reached 12% per annum for secured loans in the latter part of 1973, and rates are higher for the smaller enterprises. In most cases manufacturers must finance imports themselves. Normal payment terms for imported equipment are by letter of credit.

Practically all imported metalworking equipment is sold through sales agents or directly to end-users. The larger, more specialized firms often obtain in-

Figure 2.--Taiwan: Metalworking equipment production, new orders, and value of backlog held by local manufacturers, 1968-74



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Taiwan trade source estimates.

formation about foreign machinery directly from the suppliers and install and service the machinery themselves. With larger orders, supplier representatives often assist in installation, particularly at the machinery startup phase. A major concern expressed by local purchasers is the lack of adequate instructions for installation of the equipment provided by the manufacturers.

Warranties on machinery and parts are usually for one year and cover parts and repairs. Training and startup contracts are customarily included in the initial purchase agreements; the cost of such services is included in the original purchase price in a supplementary contract. Service and maintenance are customarily performed by the end-users.

Technical Requirements

Taiwan's standards for metalworking and finishing equipment are based on the International Standards Organization (ISO) and Japanese standards. The United States generally complies with ISO requirements and, since many Japanese standards are based on the U.S. system, American manufacturers have no difficulty in supplying the Taiwan market. The ROC National Bureau of Standards is part of

the Ministry of Economic Affairs and is located at 1 Lane 1, Cheng Kung Road, Tainan, Taiwan, Republic of China.

The electrical supply in Taiwan is 110 volts, 60-hertz, single-phase and 220 volts, 60-hertz, 3 phase. The metric system is in wide use, but the British system of weights and measures is also used. Thread sizes of all types are used in Taiwan since the island must meet the export requirements of markets in Europe, the United States, and Japan.

Published national standards for metalworking and finishing equipment in Taiwan may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230:

"The Market for Metalworking and Finishing Equipment in Taiwan," DIB 74-06-512, January 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in Taiwan. The table gives the value in U.S. dollars of various items of metalworking equipment imported by Taiwan in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

Tawain: Imports of metalworking equipment 1968-78, alternate years

(in millions of U.S. dollars)

Type of Equipment	1968	1970	1972	1974	1976	1978
<i>Metal cutting machine tools:</i>						
Automatic copying lathes, automatic lathe, single spindle	—	0.18	0.40	0.74	0.99	1.32
Automatic lathes, multiple-spindle	.01	.10	.18	.33	.44	.59
Vertical lathes	—	.03	.12	.22	.29	.39
Engine lathes	.03	.01	—	.01	.02	.03
Lathes, metal buffing	1.08	—	1	—	—	—
Lathes for watchmakers' use	—	1	1	.02	.01	.03
Turret lathes	—	.19	.07	.13	.18	.23
Lathes, n.e.s.	—	1.13	1.44	2.66	3.54	4.70
Surface grinding machines	.02	.20	.33	.61	.82	1.09
Thread grinding machines	—	.05	.01	.01	.02	.03
Internal grinding machines	—	.06	.01	.01	.02	.02
Cylinder grinding machines	—	.10	.10	.19	.25	.34
Tool grinders	—	.06	.04	.07	.10	.13
Grinding machines, n.e.s.	.31	.66	.89	1.64	2.18	2.89
Spur gear shapers	—	.02	.12	.22	.29	.39
Planers	.12	.01	.10	.18	.23	.31
Slotting machines	—	.02	.09	.16	.21	.28
Universal tool milling machines	.03	.10	.08	.15	.20	.26
Profile milling machines, including diesinking machines	—	.06	.06	.10	.14	.18
Drilling machines	.02	.14	.45	.84	1.11	1.47
Embossing machines	—	.01	.03	.06	.08	.10
Milling machines	.18	1.14	1.04	1.94	2.57	3.41
Horizontal boring machines	.04	.21	.23	.43	.57	.75
Vertical jig boring machines	—	.03	.05	.10	.14	.18
Tapping machines	—	.06	.11	.21	.27	.36
Thread rolling machines	—	.04	.05	.09	.12	.16
Boring machines, n.e.s.	.27	.24	.15	.28	.37	.49
Broaching machines	1	.03	1	—	—	—
Wire drawing machines	1	.38	.36	.68	.90	1.19
Drawing machines	—	.04	.20	.37	.49	.65
Tube-making machines	—	—	.07	.13	.16	.23
Gear cutting machines	—	.06	.03	.06	.08	.10
Vertical hobbing machines	.01	.23	.08	.15	.19	.26
Gear finishing machines	—	—	.05	.09	.11	.13
Polishing machines	—	.03	.04	.09	.12	.15
Shearing machines	.51	.45	.92	1.70	2.26	3.00
Total	2.63	6.07	7.90	14.67	19.47	25.84
<i>Metal forming machine tools:</i>						
Corrugated machines	—	.01	.01	.01	.01	.01
Hydraulic presses for working metal	—	.06	.01	.02	.02	.03
Mechanical presses for working metal	—	.58	.49	.91	1.21	1.61
Punch presses	—	.08	.01	.02	.03	.04
Swaging machines and parts thereof	—	.05	.06	.11	.15	.20
Forging machines and parts thereof	—	.02	.01	.02	.02	.03
Machine tools for working metal or metallic carbides, n.e.s.	2.24	1.30	2.29	4.28	5.68	7.54
Total	2.24	2.10	2.88	5.37	7.12	9.46
Total metalworking machine tools	4.87	8.17	10.78	20.04	26.59	35.30

Tawain: Imports of metalworking equipment 1968-78, alternate years—Continued

(in millions of U.S. dollars)

Type of Equipment	1968	1970	1972	1974	1976	1978
<i>Other metalworking equipment:</i>						
Metal casting machines	1.03	.35	.16	.33	.44	.58
Parts of metal casting machines .....	.22	.12	.03	.12	.16	.20
Ingot moulds and parts thereof	¹	.15	.01	.14	.19	.25
Moulding machines and parts thereof	—	.03	.15	.03	.04	.06
Total	1.25	.65	.35	.62	.83	1.09
Total metalworking equipment	6.12	8.82	11.13	20.66	27.42	36.39

¹ Less than \$10,000.

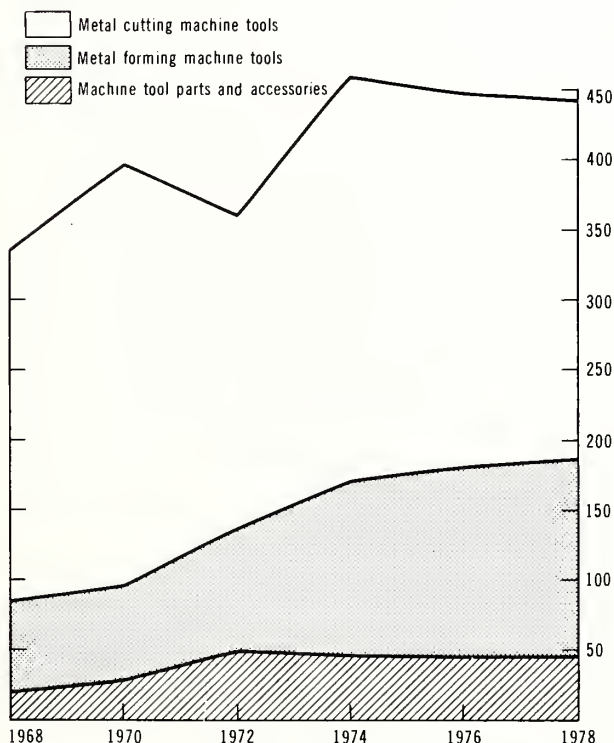
Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Taiwan trade source estimates and official trade statistics.

United Kingdom

The United Kingdom experienced exceptionally strong economic growth in 1973; the gross national product (GNP) rose by nearly 6% in real terms, and unemployment was below 3%. The boom was cut short, however, by the energy crisis and the labor difficulties that arose at year's end.

The prospects for improvement in the economic picture depend primarily on increases in foreign demand for the products of British industry and on the attainment by 1980 of self-sufficiency in sources of energy through exploitation of North Sea reserves of oil and gas.

United Kingdom-Consumption of metalworking equipment, ¹/ 1968-78, alternate years
(in millions of U.S. dollars)



¹/ Excluding tools and dies, electrochemical and electrical discharge machining equipment, metal diecasting and other casting machinery and equipment, molding boxes, & molds.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on trade source estimates.

Although firms in many industrial sectors entered 1974 with an unusually large backlog of unfilled domestic and overseas orders, most businessmen are curtailing or postponing implementation of new capital investment plans until they are reassured of continued strong demand for their products.

Outlays for metalworking equipment,¹ which rose sharply in 1973, are expected to peak at nearly \$455 million in 1974 and decline thereafter to a total of just over \$443 million in 1978 (see table 1). British industry's purchases of metal cutting machine tools increased at a rate of 11.6% per year,² between 1972 and 1974—rising from \$227 million to \$294 million, but are expected to drop to \$260 million by 1978. Nevertheless, a modest expansion is forecast for the metal forming equipment market; consumption could climb from \$116 million to \$140 million—at a rate of nearly 5% annually—between 1974 and 1978. Spending for metal forming equipment rose by 15.5% per year during the 1972-74 period. Consumption of machine tool parts and accessories, which fell slightly between 1972 and 1974, is expected to stabilize at just under \$44 million annually between 1974 and 1978.

Imports account for approximately 40% of the

¹ Tools and dies, electrochemical and electrical discharge machining equipment, metal and other diecasting machinery and equipment, molding boxes, and molds have been excluded from the discussion of metalworking equipment consumption because of incomplete data on domestic production. Import figures for these items are presented in the appendix. Data on the market for metal finishing equipment are not available.

² In order to present a more accurate picture, growth rates have been calculated from local currency values. This eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	£/U.S.\$1
1968 .....	.42
1970 .....	.417
1972 .....	.40
1974-78 .....	.41

British market for metalworking equipment. Although domestic production is substantial (\$452 million in 1972), much of it is exported. Purchases from foreign sources in 1974 were expected to approach \$190 million, representing an increase of one-third over 1972's level of \$142 million. Forecasts indicate that, despite the anticipated decline in total consumption, imports may rise by 2% annually to top \$200 million in 1978.

The United States held a better than 14% share of Britain's 1972 imports of metalworking equipment; sales of U.S.-made metal cutting and metal forming machine tools and of parts and accessories for such tools totaled \$24 million in that year. Germany, with a one-third share of the market, was the leading seller to the United Kingdom in 1972. Switzerland, with an 11% share of imports, ranked third, while Italy and Sweden were virtually tied for fourth place. Other supplier nations included France, The

Netherlands, Canada, and Japan. Recently there has been an upsurge of metalworking equipment imports from the U.S.S.R. and Czechoslovakia.

British customers look to American manufacturers for large-capacity, heavy-duty metalworking equipment. Presses, bending and forming equipment, and other metal forming equipment accounted for 20%, or \$5.6 million, of total U.S. machine tool sales to the United Kingdom in 1972. Germany was able to sell a wider variety of metal forming equipment, however, achieving sales of \$11.3 million.

Metal cutting machine tools made up one-third, or over \$9 million worth, of American sales to Britain in 1972. U.K. users reportedly believe that, in comparison to the equipment offered by Germany, Italian, and Swiss exporters, U.S.-made metal cutting machinery is more complex, and hence more expensive to buy and maintain, than is warranted by British industrial applications. However, American manufacturers are regarded as world leaders in design and production of the modular and other complete metalworking systems that will become strong sellers in the future.

The United Kingdom imported \$21 million of tools and dies for machine tools and \$18 million of miscellaneous metalworking equipment (mainly casting and molding equipment) in 1972. Most of the casting and molding equipment came from Germany. A reputation for quality carbide tool tips made Sweden

Table 1.—United Kingdom: Consumption¹ of metalworking equipment,² 1968, 1972, 1974, and 1978
(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts and accessories	Total
1968				
Production	273.8	74.9	19.2	367.9
Imports	75.6	24.7	21.6	121.9
Exports	106.3	27.8	20.4	154.5
Consumption	243.1	71.8	20.4	335.3
1972				
Production	289.2	103.6	59.0	451.8
Imports	83.1	31.3	27.3	141.7
Exports	145.1	51.5	37.5	234.1
Consumption	227.2	83.4	48.8	359.4
1974				
Production	342.2	115.7	50.6	508.5
Imports	106.0	48.2	33.7	187.9
Exports	154.2	48.2	39.8	242.2
Consumption	294.0	115.7	44.5	454.2
1978				
Production	289.2	127.7	48.2	465.1
Imports	110.7	60.3	31.3	202.3
Exports	139.8	48.2	36.2	224.2
Consumption	260.1	139.8	43.3	443.2

¹ Consumption equals production plus imports minus exports.

² Excluding tools and dies, electrochemical and electrical discharge machining equipment, metal and other diecasting machinery and equipment, and molding boxes and molds.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on United Kingdom official trade statistics and trade source estimates.

the leading seller of cutting tools and dies; Germany and the United States ranked behind Sweden, with cutting tool and die sales of \$3 million for each country.

Sales Opportunities

A market research survey recently conducted in the United Kingdom for the U.S. Department of Commerce, Office of International Marketing, identified a number of items for which American exporters of metalworking equipment should find good sales opportunities. The information used in selecting the machinery discussed in the following paragraphs was developed from an analysis of import trends, trade source comments, and questionnaires completed by individual end-users.

Numerically controlled (NC) machine tools.—Approximately 4,000 NC machine tools are in use in the United Kingdom, an estimated 30% of these machines being installed in factories producing aircraft, aircraft engines, and motor vehicles. In 1972, British industry purchased \$25.7 million of NC machinery, \$6 million of it from foreign sources. Imports may more than double during the next few years, reaching a total of nearly \$13 million in 1978.

Germany was by far the leading supplier of NC machinery to the United Kingdom, accounting for 44% of 1972 imports. British users bought \$900,000 worth, or 15%, of their total foreign-origin NC equipment from the United States, and purchased lesser quantities from Italy, France, The Netherlands, Switzerland, and Japan.

Industry in the United Kingdom is well acquainted with the advantages of applying NC technology in their manufacturing processes. Domestic production and exports of NC machine tools are substantial—\$28.9 million and \$9.2 million, respectively, in 1972—and British engineers rank among Europe's leaders in the development of NC applications and processes (software). Market analysts see significant growth potential for simple, moderately priced hard-wired equipment but relatively little demand for computer numerically controlled (CNC) machinery. Hybrid systems such as the Philips Series 5000 are finding favor among many users.

The great majority of customers purchase numerical controls as part of new equipment. Although retrofitting of existing machines with NC equipment is recognized as potentially advantageous, the decision to adopt NC technology is usually part of overall plans for general modernization of production facilities. Moreover, some firms have found the costs in time and inconvenience for such modifications to be excessive and the end result to be technically unsatisfactory.

Types of imported NC equipment likely to sell well in the United Kingdom during the 1974-78 period include the following:

- NC drilling machines
- NC milling machines
- NC and program-controlled lathes
- Multifunction NC machines with manual tool change, horizontal spindle (machining centers)
- Multifunction NC machines with manual tool change, vertical spindle (machining centers)
- Multifunction NC machines, indexing turret, vertical spindle (machining centers)

The British market for NC drilling machines in 1978 is forecast at \$2 million, compared with an estimated \$1.7 million in 1972. Imports in 1972 were valued at \$700,000, with The Netherlands providing 22% of the total, France 21%, the United States 17%, and Sweden 14%. Local manufacturers such as Herbert Boring and Drilling Ltd., Kavanaugh O'Moore & Co., Ltd., Stavely Machine Tools Ltd., and the subsidiaries of the U.S.-owned Cincinnati Milacron Ltd. and Brown and Sharpe Mfg. Co. are estimated to have produced \$3.5 million of NC drilling machines in 1972, of which \$2.5 million were exported.

During the remainder of the 1970's, British buyers in the aerospace, motor vehicle, and miscellaneous metal goods industries (as well as others) will be interested in purchasing imported NC turret-head and single-spindle NC drilling machines with positioning controls.

United Kingdom consumption of NC milling machines was estimated at \$2.7 million in 1972 and is expected to exceed \$3 million in 1978. American manufacturers accounted for more than half of 1972 imports, which totaled \$960,000. Italy and France ranked well behind the United States in sales of this type of equipment.

Leading British manufacturers such as Cincinnati Milacron Ltd., Kearney Trecker Ltd., Hayes Engineers (Leeds) Ltd., and Marwin Machine Tools Ltd. were responsible for an estimated \$5.7 million in output of NC milling machines in 1972. Approximately \$4 million of this total entered export channels.

Users in Britain's industrial sectors such as aerospace and miscellaneous metal goods are mainly interested in buying NC point-to-point control and NC contouring milling machines.

British purchases of NC and program-controlled lathes were estimated at \$14.5 million for 1972 and are projected at \$17 million for 1978. These types of lathes dominate the British imported market for NC machine tools, imports having reached \$4.3 million in 1972. Germany sold approximately 60% of those imports, but Switzerland and Italy also provided significant quantities. U.S. sales in 1972 amounted to \$275,000. Most of the market, however, is supplied from local production. Nearly \$12 million worth of NC and program-controlled lathes were produced in 1972 by British Oerlikon, Herbert-BSA Ltd., Marwin Machine Tools Ltd., Wickman

Lang Ltd., Churchill Redman Ltd., and other domestic manufacturers. Only \$1.5 million worth of these lathes was exported.

British buyers are primarily interested in importing NC horizontal point-to-point control lathes, NC horizontal-contouring control lathes, and NC vertical-contouring control lathes.

Cylindrical grinding machines.—Industry in the United Kingdom spent \$17.6 million for cylindrical grinding machines in 1972, and outlays for such equipment may top \$20 million in 1978. Imports, valued at \$5.8 million, supplied roughly one-third of the 1972 market; by 1978, however, such purchases from abroad could account for nearly 40% of the market, or almost \$8 million worth of equipment.

The United States, Germany and Sweden each accounted for approximately 20% of Britain's 1972 imports of cylindrical grinding machines. Italy's 12% market share consisted mainly of large numbers of inexpensive models. Domestic manufacturers such as Churchill Machine Tool Co. Ltd., A. A. Jones & Shipman Ltd., Landis Lund Ltd., Newall Group Sales Ltd., and GT Modules Ltd. are strongly export oriented; in 1972 they sold almost 50% of their output of \$22 million to overseas customers.

Most types of cylindrical grinding machines, including external, internal, universal, centerless, crankshaft and camshaft models, are expected to be in high demand during the 1974-78 period.

Presses.—The total 1972 United Kingdom market for all types of presses was \$27.9 million. Consumption was as follows: mechanical and pneumatic presses, \$14.7 million; hydraulic extrusion presses, \$4.5 million; and other hydraulic presses, \$8.7 million. More than one-half the output of leading domestic press manufacturers, such as Berry & Co. Ltd., Henry, Enefco (Production) Ltd., and Fielding & Platt Ltd., is sold abroad. Out of domestic production of \$36.5 million in 1972, \$21.5 million worth of presses, including \$12.2 million of mechanical and pneumatic presses, was exported.

British industry obtains roughly 50% of its requirements for presses from foreign suppliers. Imports of hydraulic presses in 1972 totaled \$6.9 million of which \$2.3 million worth were hydraulic extrusion types. American and German manufacturers each held a 25% share of the import market. U.S. firms sold \$720,000 of hydraulic extrusion presses and \$1 million of other hydraulic presses. Other important competitors in the U.K. market for hydraulic presses include Sweden, Switzerland, Canada, and Denmark.

Slightly over 20% of 1972 U.K. imports of mechanical and pneumatic presses originated in the United States. U.S. sales in that year amounted to more than \$1.25 million, out of total imports of \$6 million. Germany led the market with a 38%

share of total imports. France and Switzerland were also important suppliers.

Hydraulic extrusion presses represent a particularly good potential market for American exporters of metalworking equipment during the next few years.

Other sales possibilities.—Additional types of metalworking equipment representing favorable sales opportunities for U.S. exporters include gear cutting and finishing equipment, bed-type and knee and column milling machines, fine boring machines, automatic transfer and modular equipment, wire forming equipment, bending machines, broaching machines, and measuring and testing equipment.

There is strong demand in the United Kingdom for digital readout systems. These systems are being purchased both as accessories to new equipment and for retrofitting to existing machinery. Market analysts suggest that as many as 40,000 machine tools might be retrofitted with digital readouts during the 1974-78 period. In value terms, sales are estimated at more than \$12 million for 1974 and at \$11 million per year between 1975 and 1978.

Demand for electrical discharge machining equipment (EDM) and electrochemical machining equipment (ECM) is very much in its infancy in the United Kingdom. Only the larger and more innovative end-user firms seem to be aware of the features and potential benefits of such equipment. Except in the aerospace industry, there is considerable misunderstanding concerning the types of machines available, their cost, and their versatility. Although domestic production figures for ECM and EDM are not available, official trade statistics show 1972 exports of \$1.5 million and imports of \$2 million. Most of the imported equipment was purchased from Switzerland.

End-User Industries

British industry sectors utilizing metalworking equipment in their manufacturing activities reported capital expenditures in excess of \$2 billion in 1968, the most recent year for which appropriate data is available (see table 2). The leading end-users had capital outlays of nearly \$1.5 billion. Widespread uncertainty as to the probable growth trends in many of these sectors for the near future made predictions of the 1974-78 level of capital investment for MFE users, either individually or as a group, a virtual impossibility. Pertinent observation regarding some of the key sectors, however, are discussed in the following paragraphs.

Iron and steel.—The Government-owned British Steel Corporation (BSC) dominates the ferrous metals sector. BSC was formed in 1967 by the consolidation of the 13 major private steel companies which, at the time, accounted for 90% output of

Table 2.—United Kingdom: Principal end-users of metalworking and finishing equipment, by industry sector, 1968

Sector	No. of plants	Sales (in millions of U.S. dollars)	Capital expenditures
Construction, mining, materials handling	81,429	16,700.6	589.2
Iron and steel	1,910	5,227.6	232.5
Motor vehicles	2,005	5,810.9	189.6
Miscellaneous metal goods	13,907	4,296.5	151.0
Aerospace	355	2,068.5	74.2
Shipbuilding	1,298	1,088.2	59.8
Miscellaneous mechanical engineering equipment	5,221	1,195.7	57.1
Radio and electronic components	763	377.8	27.4
Miscellaneous electrical engineering equipment	1,159	886.5	38.6
Miscellaneous nonelectrical engineering equipment	1,490	966.5	37.4
Subtotal principal sectors	109,537	38,618.8	1,456.8
Subtotal all other sectors	14,872	16,094.6	559.7
Total all sectors	124,409	54,713.4	2,016.5

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official statistics.

primary iron and steel products. In terms of 1972 sales (\$3.7 billion), BSC compares favorably with other Western European steel producers, ranking second only to Thyssen Rheinstahl. Deliveries of finished steel exceeded 20 million tons in 1971, in which year overseas customers bought 5 million tons of iron and steel products valued at nearly \$1 billion.

The British government in 1973 initiated a 10-year, \$7-billion expansion and modernization program for BSC. In light of recent economic and political events, some delays in the implementation of parts of the plan appear inevitable. Nevertheless, the program can supply major sales opportunities for domestic and foreign suppliers of metalworking apparatus.

Specific types of American-made metalworking equipment that should be of interest to BSC and the 200 small private firms in the United Kingdom's iron and steel industry include the following:

- Cylindrical grinding machines
- Knee and column milling machines
- Mechanical presses
- Bending machines
- Horizontal boring machines
- Vertical drilling machines
- Radial drilling machines
- Bandsawing and circular sawing machines
- Center lathes
- Plate and sheet forming equipment
- Resistance welding machines

Motor vehicles.—The motor vehicle industry is one of the cornerstones of the British economy, accounting for 14% of the country's industrial production. Its prosperity, however, depends not only on growth in domestic demand for transportation equipment but also on developments in foreign markets. Exports of cars, trucks, and agricultural

tractors totaled \$1.7 billion in 1973 and, in addition, the United Kingdom shipped more than \$500,000 of internal combustion engines to overseas customers.

Although 1973 was a banner year for the motor vehicle industry, prospects for 1974 were dimmed by (1) the effects of the energy crisis on production schedules and (2) the worldwide rise in gasoline prices. Domestic sales of automobiles in 1974 are expected to be 600,000 units below 1973's 1.7 million. The chances for recovery in 1975 are as yet uncertain. Demand for trucks, however, is booming, and 1974 truck production may surpass the recorded level of 420,000 units achieved in 1973. Light vans and trucks of less than 6-ton capacity make up 80% of this market.

Major end-user firms and prospective customers in the United Kingdom for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication Target Market Trade List, *Metalworking and Finishing Equipment—United Kingdom*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230 or through your nearest U.S. Department of Commerce District Office.

In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Four companies—The Austin Morris Group, British Leyland Motors, Chrysler Corporation, and Ford Motor Co.—make 99% of the United Kingdom's passenger cars and 98% of its commercial

vehicles. British Leyland alone accounts for one-third of commercial vehicle production. Sixteen smaller firms make sport, luxury, and racing cars.

The leading producers of automotive vehicles attempt to control the manufacture of component parts to the fullest extent possible. They purchase the remainder of their requirements from independent suppliers. Four main firms together account for 40% of the component parts market. Lately, some of Britain's aircraft firms have put idle equipment to work making castings and other vehicle components.

According to a recent government estimate, two-thirds of the fixed assets of the motor vehicle industry (exclusive of land, buildings, and special tools) were purchased within the last 10 years. The industry spent \$312 million for capital goods in 1972.

The installation of automatic machine tools has brought about the widespread mechanization of engine and subassembly manufacture. The application of NC machinery and in-process gauging equipment is growing and will reinforce efforts to standardize basic equipment design.

Market analysts have identified the following metalworking equipment as being of current interest to buyers in the industry:

- NC drilling machines
- NC and program-controlled lathes
- Cylindrical grinding machines
- Hydraulic extrusion presses
- Gear cutting and finishing machines
- Mechanical presses
- Bed-type milling machines
- Knee and column milling machines
- Fine boring machines
- Automatic transfer/unit construction machinery
- Measuring and testing equipment
- Broaching machines

Aircraft.—The British aircraft industry, one of the world's largest, is a vital contributor to the country's export earnings. Names such as Hawker Siddeley and British Aircraft (airframes), Rolls-Royce (engines), Westland (helicopters), and British Hovercraft are known and recognized throughout the world. One-third of the industry's output of airplane fuselages and engines is exported; such shipments reached a record level of \$1.2 billion in 1973.

Now, however, the industry finds itself at the end of a 7-year period in which the development of new generations of aircraft sparked the industry's rapid growth. No major breakthroughs are presently in sight. Furthermore, there is some possibility that the huge "Concorde" supersonic transport (SST) project being carried out in cooperation with France may yet be canceled. On the defense side, it seems assured that further cutbacks will be made in weapons procurement. While investments totaling \$7.8 billion are planned for 1974-75, retooling expenditures are likely to be modest, being limited to requirements for modifying and improving current models.

The aircraft industry is one of the United Kingdom's most technologically sophisticated users of metalworking equipment. It is the best market for high-precision machinery, accounting for an estimated 20% of British purchases of NC machine tools. Market analysts report a rise in demand for digital readouts and a continuing market potential for NC machine tools. A number of new techniques using equipment developed by British manufacturers, such as fully automated "hot air" bonding and new methods of diecasting, are being adopted.

American-made equipment of particular interest to firms in the British aircraft industry is as follows:

- NC drilling machines
- NC milling machines
- NC program-controlled lathes
- Cylindrical grinding machines
- Hydraulic extrusion presses
- Mechanical presses
- Bed-type milling machines
- Knee and column milling machines
- Fine boring machines
- Measuring and testing equipment

Miscellaneous metal products.—The principal metalworking equipment end-users within this industry are the manufacturers of bolts, nuts, and screws (370 firms with combined 1970 sales of \$410 million), the producers of wire and wire products (430 firms with total 1970 sales of \$819 million), and the makers of cans and metal containers (118 firms with 1970 sales totaling \$386 million).

Guest, Keen & Nettlefold Ltd. is the United Kingdom's chief manufacturer of bolts, screws, and nuts and is also a leading maker of wire and wire products. This company plans capital investments of \$108 million per year in 1974 and 1975, with half the sum to be spent on plant expansion and half on product diversification.

American-made metalworking equipment currently of special interest to firms in the miscellaneous metal products industry includes:

- NC milling machines
- NC program-controlled lathes
- Cylindrical grinding machines
- Hydraulic extrusion presses
- Mechanical presses
- Wire forming machinery

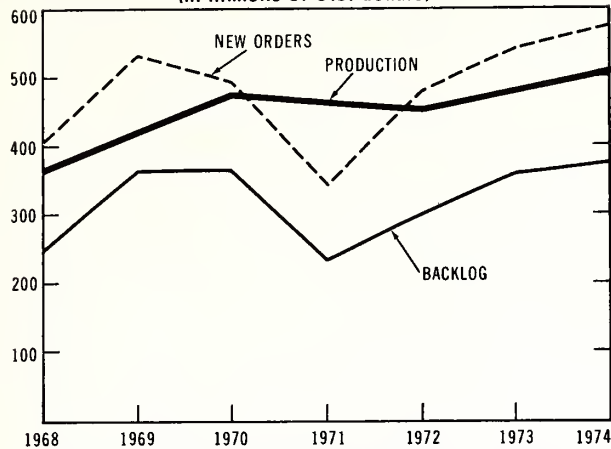
Domestic Manufacture of Metalworking Equipment

British manufacturers were expected in 1974 to produce more than \$500 million of metalworking equipment, including parts and accessories for machine tools, compared with \$452 million in 1972 and \$370 million in 1968. Table 3 lists the industry's principal products.

A cylindrical decline in production is expected to occur during the 1975-77 period, but output should begin to rise again late in 1977 and should

**The United Kingdom-Machine tool production,¹
new orders, and value of backlog held by
local manufacturers, 1968-74**

(in millions of U.S. dollars)



¹ Alternate years. Data includes metal cutting equipment, metal forming equipment, and parts and accessories for machine tools. Excludes tools and dies.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

reach \$465 million in 1978. Data on production of tools and dies for machine tools and on the manufacture of metal finishing equipment are not available.

Relatively low production costs have helped make British metalworking equipment a strong seller in world markets, nearly 50% of the country's output being sold abroad. Exports for 1974 were estimated at \$242 million, up slightly from \$234 million in 1972. Current forecasts place 1978 export sales at \$224 million.

Turning machines, grinding machines, milling machines, presses, unit head transfer and machining centers are most in demand in overseas markets, but NC equipment is rapidly gaining in importance. The principal customers are in Europe; during the first 8 months of 1972, 30% of the United Kingdom's metalworking equipment exports went to other European Economic Community (EEC) member nations. An additional 16% was sold to Commonwealth countries, while the U.S.S.R. and the United States took 10% and 7% respectively.

Although the United Kingdom is a major participant in the world market for machine tools, its ability to supply domestic needs is consistently impaired because local manufacturers fail to anticipate and respond promptly to surges in demand. Consequently, end-users must regularly turn to foreign suppliers to obtain the equipment they need within the desired time frame. In an effort to increase their flexibility and improve their competitive position, leading firms have recently reorganized their managerial and administrative structures. In many cases, substantial cutbacks are being made in product lines. Some observers believe that these steps will make the

British machine tool industry more efficient and better prepared to achieve its fullest potential now than at any time in recent years.

Approximately 130 firms comprise the British metalworking and finishing equipment industry and six of these companies are said to account for some 50% of the sector's output. The largest firm is Alfred Herbert, Ltd., a corporate group of which Herbert-BSA is the principal machine tool producer. Herbert-BSA's 1972 output is placed at \$77 million, down 22% from 1971. Lathes other than center lathes represent 75% of this company's production, with horizontal borers second in the product line. Herbert is giving high priority at present to the further development of NC lathes. The firm plans to boost its exports from 35 to 50% of total sales by 1976.

Wickman, Ltd., part of the John Brown group, makes a range of grinding machines, milling machines and lathes. Wickman sold nearly \$100 million worth of such equipment in 1972. A U.S. subsidiary of Cincinnati Milacron Ltd. exports 50% of its output of power presses, numerically controlled milling and grinding machines, and add-on numerical controls. Other leading manufacturers, with their 1972 MFE output figures, include Tube Investments Ltd. (\$51 million), George Cohen 600 Group Ltd. (\$42 million) and Staveley Machine Tools Ltd. (\$32 million).

Approximately 25 subsidiaries of foreign corporations are engaged in the manufacture of metalworking equipment in the United Kingdom. Most of them are subsidiaries of American firms. The leaders, all U.S.-owned companies, are Adcock & Shipley (drilling machines, milling machines, NC machine tools), Cincinnati Milacron (presses, milling machines, grinding machines, numerical controls), Landis Lund (grinding machines) and Norton Abrasives (grinding machines, milling machines, and lathes.) An influx of European manufacturers is to be expected now that the United Kingdom has joined the EEC.

Table 3.—United Kingdom: Principal items of metalworking equipment domestically produced, 1972

Equipment	Production (in millions of U.S. dollars)
Automatic bar and chucking lathes	40.0
Centering lathes	32.3
Punching and shearing machines	24.3
Cylindrical grinding machines	22.0
Machining centers, unit construction and transfer machines	21.3
Mechanical and pneumatic presses	21.0
Wire drawing machinery	20.3
Hydraulic presses	15.5

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

Relatively low production costs continue to prevail in Great Britain despite the inflation of the past few years. The differential should prove especially attractive to German and Swiss machine tool manufacturers.

British membership in the EEC is also expected to spark an increase in the number of American and other foreign manufacturers seeking licensees to produce their equipment in the United Kingdom for sale, free of duty, in other EEC markets. British firms have traditionally avoided manufacture under license, preferring to develop their own product designs. There are signs, however, that this attitude may be changing.

Trade Regulations and Practices

The United Kingdom is gradually aligning its tariff schedule with the EEC's Common External Tariff. Customs duties currently in effect for metalworking and finishing equipment range from 5.5 to 11% on the c.i.f. value. Further adjustments are scheduled to be made, which will reduce the duties on some items to as low as 2.5% by mid-1977.

Most imported machine tools are marketed in the United Kingdom by distributors or commissioned agents, many of whom are themselves manufacturers or suppliers of similar domestically made equipment. Approximately a dozen leading firms together represent more than 100 overseas metalworking equipment producers. Manufacturers' sales subsidiaries, however, are expected to play an increasingly important role in the future, since few agents and distributors are equipped to effectively

promote the more complex machinery and complete production systems now being introduced by American and other suppliers. Moreover, the major customers greatly prefer to deal directly with the foreign manufacturer.

Technical Requirements

Standards for the production and use of metalworking equipment in the United Kingdom are published by the British Standards Institute, 101 Pentonville Road, London N1 9ND.

The characteristics of the electrical power supply in most areas of the United Kingdom are 200/250 volts, 50 hertz, single or 3-phase, where the maximum current demand does not exceed 13 amps. For loads over 3 kilowatts, the Electricity Board requires 400/450 volt, 3-phase, 4-wire connections.

Published national standards for metalworking and finishing equipment in the United Kingdom may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230:

"The Market for Metalworking and Finishing Equipment in the United Kingdom": DIB 74-12-515, March 1974.

Appendix

The following tables contain additional information for the U.S. businesses that are interested in selling their products in the United Kingdom. The tables below give the value in U.S. dollars of various items of metalworking equipment imported by the United Kingdom in 1968, 1970, and 1972. In addition, projections by product category are made for the years 1974, 1976, and 1978.

United Kingdom: Imports of metalworking equipment, 1968-78, alternate years (in millions of U.S. dollars)

Type of Equipment	1968	1970	1972			
<i>Metal cutting machine tools:</i>				Wire drawing machines .....	.7	1.0 2.0
Hand or pedal operated machine tools	—	0.2	0.3	Other metal forming machine tools....	2.4	2.4 4.0
Machining centers	2.6	2.4	1.2	Total	24.7	25.7 31.3
Unit construction and transfer metal cutting machine tools	4.8	12.0	6.2	<i>Parts, accessories, and tools and dies for machine tools:</i>		
NC boring machines .....	.7	1.0	—	Machine vises, chucks, tool holders....	4.3	1.2 4.5
Jig boring machines	—	2.7	1.8	Metal cutting accessories and parts	11.3	16.3 14.3
Horizontal boring machines	2.7	2.9	2.4	Other machine tool accessories and parts	6.0	11.1 8.5
Vertical boring machines .....	.2	.2	.5	Blades for metal cutting circular saws	1.2	— .8
Other boring machines	1.4	1.4	1.0	Metal cutting bandsaw blades	—	— .5
Broaching machines .....	.2	.2	—	Threading dies and taps	—	.7 1.0
NC drilling machines	1.9	1.2	.7	Twist drills and bitstock drills	1.7	2.9 3.5
Radial drilling machines .....	.2	.5	.2	Press tools, molds and dies	3.3	9.6 5.0
Other drilling machines	3.1	2.7	2.8	Milling cutters; reamers, countersinks; shaper, planer tools, etc. ....	.7	1.2 1.2
Gear cutting and making machines	1.7	2.4	.5	Sintered metal carbide dies	—	.2 .5
Gear hobbing machines	1.4	1.7	.7	Other tools for machine tools	1.7	1.4 1.0
Other gear making and finishing machines	2.2	2.9	2.8	Sintered metal carbide tool tips	3.6	8.2 7.5
Cylindrical grinding machinery	5.1	5.7	5.8	Total	33.8	52.8 48.3
Surface grinding machines	2.4	3.6	3.8	<i>Other metalworking equipment:</i>		
Other grinding machines	5.5	8.2	7.8	Electrochemical and electric discharge machining equipment	2.2	1.9 2.0
Honing and lapping machines	1.0	1.9	1.0	Metal diecasting machinery	—	2.2 3.0
NC or program-controlled lathes	3.4	5.7	4.3	Other casting machinery and equipment	2.9	2.4 8.5
Automatic bar lathes	2.4	4.8	2.8	Molding boxes and molds	3.3	4.8 4.5
Automatic chucking lathes	2.9	4.6	2.8	Total	8.4	11.3 18.0
Capstan and turret lathes	2.6	2.9	1.2	Total metalworking equipment....	142.5	193.5 180.7
Centering lathes	1.4	1.4	1.4			
Copying lathes	1.4	1.4	2.8			
Vertical boring lathes and turning machines .....	.5	1.7	2.2			
Other lathes	2.4	2.7	3.8			
NC milling machines	1.4	1.9	1.0			
Other milling machines	13.3	13.4	10.3			
Planing machines .....	.7	—	—			
Sawing machines	1.7	3.1	3.3			
Screwing, threading, tapping machines	2.2	4.1	4.3			
Shaping and slotting machines	1.0	1.2	1.2			
Other metal cutting machine tools	1.2	1.0	2.2			
Total	75.6	103.7	83.1			

<i>Metal forming machine tools:</i>			
Bar, tube and section drawing, bending and forming equipment	3.1	2.7	3.3
Plate and sheet bending and forming machines	2.0	1.9	3.3
Forging and swaging machines	2.7	4.1	2.5
Hydraulic extrusion presses	0.7	0.7	2.3
Other hydraulic presses	5.5	5.0	4.7
Mechanical and pneumatic presses	3.8	3.8	5.9
Punching and shearing machines	2.9	4.1	3.3

United Kingdom: Imports of metalworking equipment; projections for 1974, 1976, and 1978

(by product category only; in millions of U.S. dollars)

Type of equipment	1974	1976	1978
Metal cutting machine tools	106.0	115.7	110.7
Metal forming machine tools	48.2	62.7	60.3
Parts, accessories, and tools and dies for machine tools	60.2	55.4	53.0
Other metalworking equipment	19.3	21.7	16.9
Total metalworking equipment....	233.7	255.5	240.9

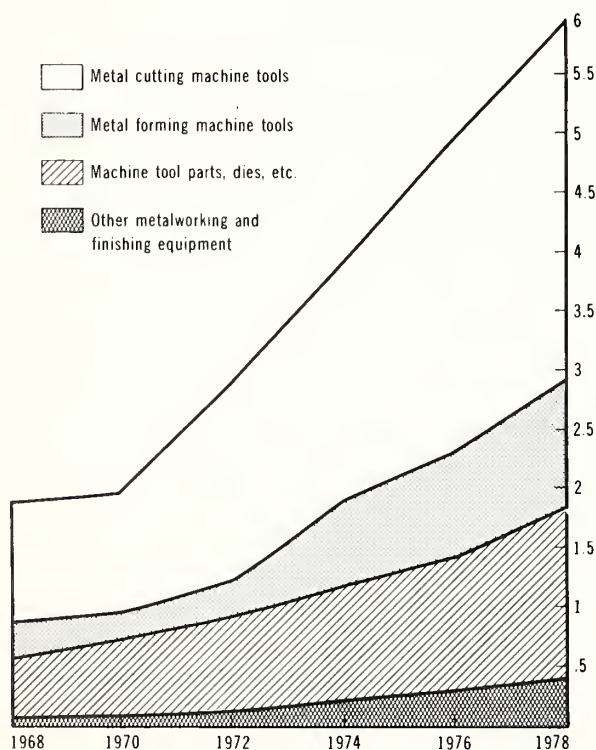
Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on United Kingdom official trade statistics and trade source estimates.

Union of Soviet Socialist Republics

The Soviet Union is achieving steady economic growth through a centrally planned economy administered according to priorities set by its top leadership. Growth rates under the Ninth Five-Year Plan (1971-75) appear to be slightly slower than those achieved previously, and more attention is now being paid to meeting consumer needs. National income is projected to rise by about 39% from 1971 to 1975, as compared to a 41% increase experienced during the 1965-70 period. Industrial production is slated to rise by 47%, a slight drop from the 50% gain registered under the Eighth Plan.

U.S.S.R. -- Consumption of metalworking and finishing equipment, 1968-78, alternate years.

(in billions of U.S. dollars)



Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Soviet trade source estimates.

The current plan calls for improvement in planning and management, increased labor productivity through technological developments, and greater efficiency in use of raw materials and other resources. The highest growth rates are expected in the machine building industries, particularly in the automotive and the chemical sectors. Priority also will be given to the electric power, fuel production, and instrument building industries. In line with the planned expansion of these and other sectors, including large-scale development in Western Siberia, capital investment in the industrial sector is scheduled to increase by nearly 6.5%¹ annually, climbing from \$108 billion in 1971 to \$147 billion in 1975.

Sustained industrial development already has required substantial purchases of metalworking and finishing equipment (MFE). From 1972 to 1974, the Soviet market for MFE grew by nearly 11% a year, rising from \$2.7 billion to an estimated \$3.9 billion (see table 1). The market is expected to slightly exceed this rate of growth during the 1974-78 period, approaching \$6 billion in the latter year.

Most machine tools currently in use throughout the Soviet Union are relatively modern, only about one-third of them being considered obsolete. Most of the forthcoming Soviet purchases will be for installation in new production facilities rather than for replacement of existing machinery. However, under the current plan, up to 30% of the installed metal cutting equipment and the metal forming machinery is due to be replaced. Approximately 70% of imported MFE will be used for the estab-

¹ In order to present a more accurate picture of market trends, growth rates have been calculated from local currency values.

The following exchange rates have been used in converting local currency into U.S. dollars:

Year	Rubles/U.S. \$1.00
1968-70 .....	.90
1972 .....	.83
1974-78 .....	.72

lishment of new plants, 25% will be for modernization, and the remainder will be for demonstration or training purposes.

The Soviet market for all categories of MFE is expected to expand considerably over the next several years. Consumption of metal cutting machine tools is projected to increase by over 11.5% annually, climbing from \$2 billion in 1974 to more than \$3 billion in 1978. Metal forming machine tools will be in increased demand, and this market sector should approach \$1.1 billion in 1978. This will reflect an anticipated average yearly increase of almost 15% over the 1974 level of \$625 million.

The substantial Soviet market for machine tool accessories, parts, tools and dies—\$707 million in 1972—is expected to rise from an estimated \$960 million in 1974 to approximately \$1.3 billion in 1978. A viable market has emerged for metal finishing equipment; estimates suggest that purchases may rise by 13% annually during the 1974-78 period, reaching \$125 million from a base of \$77 million.

Until recently, the market for machine tools reflected the Soviet Union's objective of attempting to achieve self-sufficiency in industrial production. The country is now turning to Western suppliers because production of MFE in the U.S.S.R. and other Socialist countries is insufficient to enable realization of the ambitious development goals established in priority industrial sectors. Furthermore, the Soviets also are interested in the advanced technology incorporated in Western equipment. Consequently, equipment imports from the West, which in the past might have been regarded primarily as a means to overcome unforeseen bottlenecks, are now a normal, planned feature of Soviet economic policy.

The Soviet Union's 1978 imports of metalworking and finishing equipment are expected to approach \$2 billion, or approximately one-third of the projected total market. Purchases of foreign-made MFE grew approximately 27% annually from \$560 million in 1972 to over \$1 billion in 1974 and should expand at a slower but nonetheless impressive rate of 17.5% through 1978 (see appendix).

Imports will be increasingly significant in the market for metal cutting machinery. Such imports in 1972 were valued at \$350 million, or 25% of consumption; in 1978, however, foreign-made equipment is projected to account for \$1.3 billion, or 43% of the market. Domestic production also is on the upswing and is likely to double its 1972 level to reach \$2.2 billion in 1978. The country's

Table 1.—U.S.S.R.: Consumption ¹ of metalworking and finishing equipment 1968, 1972, 1974 and 1978
(in millions of U.S. dollars)

	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, accessories tools and dies	Metal finish- ing equipment	Other	Total
1968						
Production	817	220	477	31	65	1,610
Imports	120	46	17	6	7	196
Exports	69	12	14	3	1	99
Consumption	868	254	480	34	71	1,707
1972						
Production	1,175	330	693	45	110	2,353
Imports	350	134	40	15	21	560
Exports	136	27	26	5	2	196
Consumption	1,389	437	707	55	129	2,717
1974						
Production	1,570	459	931	63	153	3,176
Imports	695	208	64	21	46	1,034
Exports	251	42	35	7	4	339
Consumption	2,014	625	960	77	195	3,871
1978						
Production	2,223	765	1,237	97	229	4,551
Imports	1,334	389	105	38	110	1,976
Exports	431	68	49	10	5	563
Consumption	3,126	1,086	1,293	125	334	5,964

¹ Consumption equals production plus imports less exports.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on U.S.S.R. official trade statistics and trade source estimates.

Age of Soviet machine tools
(in percent)

	Less than 5 years	5-10 years	10-20 years	More than 20 years
Lathes	29.7	26.9	28.0	15.4
Milling and drilling machines	36.0	27.0	25.0	12.0
Grinding machines	33.7	27.1	23.6	15.6
Boring machines	29.4	28.1	26.4	16.1
Planing machines	19.9	18.6	33.9	27.6
Shaping machines	21.7	21.7	27.4	29.2
Slotting and broaching machines	23.1	21.9	35.4	19.6
Gear cutting machines	27.2	26.1	28.8	17.9
Transfer lines	39.2	31.7	22.0	7.1
EDM	46.6	36.7	14.9	1.8
ECM	66.5	26.6	5.9	1.0
Ultrasonic equipment	40.0	43.4	15.9	0.7
Other metal cutting machines	40.0	26.4	21.2	12.4
Mechanical presses	25.5	23.7	29.5	21.3
Hydraulic presses	42.1	29.2	22.3	6.4
Automatic forging presses	34.4	20.3	33.3	12.0
Hammers	30.7	23.3	30.2	15.8
Forging equipment	27.6	24.0	29.1	19.3
Bending and straightening machines	46.0	27.7	18.4	7.9
Shears	38.3	28.4	22.4	10.9
Other metal forming machines	33.2	20.7	23.9	22.2

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

exports of metal cutting machinery are expected to more than triple during the 1972-78 period, climbing to \$431 million in the latter year.

Soviet imports of metal forming machine tools may reach \$389 million in 1978, representing 36% of that year's projected consumption as compared with 31% of the 1972 market. Foreign suppliers are upping their market shares despite anticipated increases in Soviet production of metal forming equipment. Such production is predicted to reach \$765 million in 1978, reflecting an approximate 15% annual rise over the 1972 level of \$330 million.

Purchases of metal parts deburring and finishing equipment from abroad are expected to more than double, rising from \$15 million in 1972 to \$38 million in 1978. Local production during the same period should show similar rates of growth, reaching \$97 million in 1978; \$10 million of this equipment will most likely be exported.

Although domestic manufacturers will continue to meet the bulk of Soviet requirements for machine tool parts and dies, foreign suppliers should succeed in making a greater penetration into this market. Imports in 1978 are projected at \$105 million, or about 8% of total purchases; by contrast, imports in 1972 accounted for \$40 million, or 6% of consumption. Soviet production in 1978 could approach \$1.3 billion, or twice its 1972 level.

The United States has benefited from increased

Soviet trade with the West. While Western nations expanded their share of the MFE import market from 40% in 1968 to 58% in 1972, American suppliers held a firm position in the market, providing \$27.7 million (or 5%) of 1972's foreign purchases (see table 2). Trade sources in the Soviet Union estimate that imports from the United States in 1973 doubled over the preceding year and should represent 8% of imports in 1978.

West Germany is the Soviet Union's largest Western supplier of MFE, claiming a 21% share of this import market in 1972. The United Kingdom has achieved considerable success, with sales slightly above the United States in 1972 and a 6% market share. Italy has been a major supplier, providing \$20.4 million in 1972, and has benefited significantly from the establishment of a Fiat plant in the Soviet Union. The Japanese have made considerable efforts to establish themselves in the Soviet market, particularly through joint agreements in connection with the development of Siberia, and supplied MFE worth almost \$23 million in 1972.

The United States was the U.S.S.R.'s third largest Western supplier of metal cutting machinery in 1972, accounting for 7% of foreign purchases. West Germany provided the largest share, 25%, while the United Kingdom supplied slightly over 7%. The United States recorded its initial sales of metal forming equipment in 1972, when it supplied \$1.2

Table 2.—U.S.S.R.: Imports of metalworking and finishing equipment, by selected Western suppliers, 1972
(in millions of U.S. dollars)

Industry	U.S.	West Germany	U.K.	Japan	Italy	Other	Total imports
Metal cutting machine tools	24.1	88.3	25.4	13.2	14.4	184.6	350
Metal forming machine tools	1.2	20.6	2.4	8.5	3.6	97.7	134
Subtotal metalworking equipment	25.3	108.9	27.8	21.7	18.0	282.3	484
Machine tool parts, accessories, tools and dies, etc.	1.2	4.8	4.8	—	2.4	26.8	40
Metal finishing equipment	—	2.4	1.2	1.2	—	10.2	15
Other	1.2	1.2	1.2	—	—	17.4	21
Total	27.7	117.3	35.0	22.9	20.4	336.7	560

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official U.S.S.R. statistics and trade source estimates.

million worth. Imports from West Germany amounted to \$20.6 million and those from Japan to \$8.5 million.

The Soviet Union relies heavily on Eastern European countries as suppliers of metalworking and finishing equipment. Together with North Korea, they supplied \$157.7 million of metal cutting equipment and \$59.1 million of metal forming machinery in 1972 (see table 3). East Germany is particularly significant in the market, with sales of machine tools valued at \$117.3 million in 1972. Other important Socialist suppliers are Czechoslovakia and Poland.

Sales Opportunities

A market research study recently conducted in the U.S.S.R. for the U.S. Department of Commerce, Office of International Marketing, reveals good sales opportunities for American manufacturers of a broad range of metalworking and finishing equipment. Analysis of trade statistics and consultation with trade experts indicate specific items which should be in demand from U.S. suppliers over the next several years. The following categories are in order of highest demand.

Gear making equipment.—The Soviet Union is making an unprecedented effort to expand production of automobiles for private use and to upgrade the quality of other motor vehicle output under the current Five-Year Plan. As a result, the market for gear making equipment is expected to increase from \$158 million in 1972 to \$437 in 1978, representing a more than 17% average annual rise. While domestic production of gear cutting machinery during the 1972-78 period is projected to more than double, going from \$107 million to \$222 million, it will still be outstripped by market growth. Gear making equipment is manufactured in factories in Gorky and Moscow. Imports, which amounted to \$56 million, or 35%, of the 1972 market, are projected to account for over half of total purchases in 1978.

The United States, regarded as the leader in gear

generating machinery, is the Soviet Union's largest foreign supplier, holding a 30% share of 1972 imports. The Gleason-Works is recognized as a major exporter of gear cutting equipment to the U.S.S.R. Germany, which accounted for 26% of the Soviet Union's 1972 imports, is the major foreign competitor. The German firms of Liebherr Verzahn-technik, Heidenreich & Harbeck, Pfauter, and Klingenberg are also active exporters. Matrix-Coventry and Sykes, two British companies, the Swiss concern, Oerlikon-Buerle, sell small quantities of gear cutting equipment to the Soviet Union. Such Eastern European firms as Csepel (Hungary) and Celakovice (Czechoslovakia) also sell to the Soviet Union, supplying mainly conventional items.

Soviet industry, with vast experience using American-made gear cutting machinery, is looking to U.S. companies for much of the equipment for the new motor vehicle factories that are either under construction or are being planned for the near future. Soviet planners have a high regard for the equipment used in the mass production of automobiles in the United States. Furthermore, the goal of raising the reliability of Russian trucks will necessitate the use of precision machinery, for which the American manufacturers also have an excellent reputation.

The following types of equipment will be in demand from American suppliers over the next several years:

- Bevel gear generators
- Gear hobbing machines for cylindrical gears
- Gear cutting machines for cylindrical gears
- Gear hobbing machines for bevel gears
- Spline shaft milling machines
- Gear tooth chamfering machines
- Gear grinding machines
- Gear honing machines
- Bevel gear grinding machines
- Spline shaft grinding machines
- Worm gear grinding machines
- Gear lapping and polishing machines
- Gear shaving machines
- Gear deburring machines
- Gear hardening machines

Table 3.—U.S.S.R.: Imports of machine tools by Socialist suppliers, 1972, 1973
(in millions of U.S. dollars)

	Metal cutting machine tools				Metal forming machine tools ¹	
	1972	1973	1972	1973	1972	1973
	Value	Units	Value	Units	Value	Value
East Germany	75.5 ²	3,604	90.4	3,192	41.8	42.7
Czechoslovakia	35.9	3,048	29.2	2,007	17.3	18.3
Poland	26.5	2,251	23.4	1,293	³	—
North Korea	10.2	2,067	6.9	1,273	—	—
Rumania	4.5	543	4.1	449	—	—
Hungary	3.5	623	3.0	356	—	—
Bulgaria	1.6	399	1.7	221	—	—
Total	157.7 ⁴	12,535	158.7	8,791	59.1 ⁴	61.0

¹ No unit quantities given.

² Totals for metal cutting machine tools from East Germany do not include figures reported for imports of "lines of metal cutting machines" which were \$711.5 thousand in 1972 and \$6.3 million in 1973.

³ No figure given. It is assumed that volume is either 0 or negligible. No figures were given for imports of machine tools from the People's Republic of China or Albania.

⁴ No figure given. It is assumed that volume is either 0 or negligible. No figures were given for imports of machine tools from the People's Republic of China or Albania.

⁵ Because of differences in sources, these figures may not be comparable to totals in tables 1 and 2 and the appendix.

Source: Official U.S.S.R. Trade Statistics.

Grinding machines.—Soviet consumption of grinding, lapping, and honing machines amounted to \$278 million in 1972 and is expected to rise by about 15% a year through 1978, reaching \$674 million in that year. Imports, over 50% of which originated from Western countries, were valued at \$80 million in 1972, when they accounted for 23% of the total market. Purchases of grinding machines from abroad should increase from 1972 to 1978 by over 20% annually and to reach \$307 million, or nearly 47% of consumption. Although domestic manufacturers are striving to increase production from \$203 million in 1972 to almost \$370 million in 1978, they are expected nevertheless to supply a declining share of the market. Grinding machines are produced in the following Soviet cities: Kirovakan, Leningrad, Taganrog, Voronesh, and Kuybyshev.

Germany was the U.S.S.R.'s leading foreign supplier of grinding machinery, with a 27% share of the 1972 import market. The United Kingdom followed with a 9% market share, and the United States, Italy, and Japan each supplied \$1.2 million. The leading Western exporters include four German companies; Deckel, Acme-Neu-Isenburg, Herman Kolb, and Waldrich-Coburg, and three firms from the United Kingdom, Alfred Herbert, Matrix-Coventry, and Hayes Engineers (Leeds). The Soviet Union also purchases grinding machinery from Szim of Hungary, ZM Zarkisko of Poland, Hostivar of Czechoslovakia, and Schleifmaschinenwerk Karl-Marx-Stadt of East Germany.

Expanding Soviet requirements for high-speed, precision machinery, not readily available domestically, have increased demand for foreign equip-

ment. U.S.-made machinery, with faster wheel speeds than most competing grinders, is favored, particularly the following types:

- External cylindrical grinding machines
- Centerless grinding machines
- Internal grinding machines
- Jig grinding machines
- Superfinishing machines
- Surface grinding machines
- Surface and profile grinding machines
- Double-spindle surface grinding machines
- Axle journal grinding machines
- Thread grinding machines
- Piston ring grinding machines
- Copy grinding machines
- Ball grinding and lapping machines
- Crankshaft grinding machines
- Cam and camshaft grinding machines
- Oval grinding machines
- Plane parallel grinding machines
- Valve grinding machines
- Roll grinding machines

Hydraulic presses.—Because Soviet users import hydraulic presses chiefly as parts of complete transfer lines or special-purpose equipment; trade sources report that it is difficult to ascertain total import figures for this type of equipment. Consumption was valued in excess of \$120 million in 1972 and is expected to amount to approximately \$290 million in 1978. Purchases of hydraulic presses from Western countries were estimated to have been \$10 to \$15 million in 1972 and are expected to reach \$40 to \$50 million in 1978.

Soviet production of hydraulic presses, valued at \$114 million in 1972, is not considered sufficient to meet demand, particularly for those types needed

in highly automated mass production lines. Local output is being accelerated and should reach \$245 million in 1978. Presses are made in Odessa, Vitebsk, Moscow, Leningrad, Minsk, and Chita.

American made hydraulic presses which are highly automated and suitable for mass production are highly regarded in the Soviet Union. Planned heavy investments in the automotive and tractor industries, among the largest users of hydraulic presses, will boost demand for American equipment. Bliss, Danly, Clearing, and Verson are all well-known U.S. suppliers to Soviet manufacturers. Other Western companies selling hydraulic presses to the U.S.S.R. include Schuler-Pressen and Schenk of Germany, British Clearing of the United Kingdom, Ateliers et Chantiers de Bretagne of France, and Voest-Verreinigte Osterreichische Eisen-und-Stahlwerke of Austria. The most important East European suppliers are the Polish firms, Hydomat and Wafoum.

Specific types of equipment in demand from U.S. suppliers are:

- Vertical straight side (two- and four-point) presses
- Transfer feed presses of all types
- Double- and four-column presses
- Straightening presses

Machining centers.—The Soviet market for machining centers is largely supplied by imports, since domestic production is limited and Soviet technology is assessed by trade sources as lagging 2 to 3 years behind the Western level. Imports from Western countries amounted to roughly \$25 million in 1972 and are expected to increase rapidly, reaching a projected \$50 to \$70 million in 1978.

German companies have been the leading foreign suppliers to date, followed by British, French, Italian, and American manufacturers. A subsidiary of Gildemeister, Max Muller of Germany, sold the U.S.S.R. 100 machining centers in 1972. Other active suppliers from Germany include Gildemeister and Fritz Werner. Olivetti (Italy), Sundstrand (Sweden), and Amtec (France) also sell machining centers to the Soviet Union. Cincinnati Milacron and Brown & Sharp are the most prominent American suppliers. The principal East European firms are the East German companies, Werkzeugmaschinenkombinat "7.Oktober" and the Berliner Werkzeugmaschinenfabrik. East Germany runs demonstration machining centers in various Soviet factories.

Soviet manufacturers are interested in increasing purchases from the United States because of the higher speeds in positioning or tool changing, as well as the greater accuracy, attained by U.S.-designed machining centers. The following types will be in demand:

- Numerically controlled machining centers (two and three axes)
- Machining centers with automatic tool changes

Lathes.—The U.S.S.R. market for lathes is expected to almost double during the 1972-78 period, expanding from \$490 million to \$922 million. Imports of special and high-production lathes should be increasingly important, since single Soviet manufacturers have emphasized the production of general-purpose turning machines and cannot yet meet the rising demand for specialized and high-precision equipment. Imports in 1972 amounted to \$94 million, or 19% of total consumption, and should represent nearly 40% of the anticipated 1978 market. Western countries are expected to maintain their 60% share of the import market through 1978.

Soviet manufacturers produced \$459 million of lathes in 1972 and supplied most of the country's requirements for conventional machines. Lathes produced in Moscow, Ryazan, Krasnodar, and other Soviet cities were mainly standard types. Output in 1978 is projected to top \$734 million, of which \$170 million will most likely be exported.

American manufacturers are just beginning to enter this import market, heretofore dominated by Germany. Soviet users are showing a definite preference for U.S.-made manufacturing lathes as parts of complete systems for the production of automotive and other industrial parts. The leading U.S. suppliers are The Cross Company, Lasalle, Ingersoll, Bendix, Ex-Cell-O, Fellows-Corporation, and Cincinnati Milacron. Gildemeister, Max Muller, Schaublin, Fritz Werner, Waldrich-Siegen, and Deckel are the major German firms selling lathes to the Soviet Union. Other European suppliers include Matrix-Coventry and Hayes of the United Kingdom, Oerlikon-Buerle of Switzerland, and Canavese of Italy. Eastern European competition is mainly from Szim, Hulin (Czechoslovakia), Wafoum (Poland), and Grobdrehmaschinenbau "8.Mai" (East Germany).

The United States is in a good position to increase sales, particularly of piston, camshaft, and crankshaft lathes, which are considered highly competitive. Specific types of equipment with good sales potential are the following:

- Manufacturing lathes
- Copy lathes
- Axle turning lathes
- Axle journal turning and roller burnishing machines
- Double-ended centering and facing machines
- Crankshaft turning lathes
- Oval turret lathes
- Multispindle lathes
- Screw machines
- Turret lathes
- Single-spindle bar or chucking lathes

Other sales opportunities.—Trade sources in the Soviet Union indicate that substantial sales opportunities exist for American exporters of a number of other types of metalworking and finishing equip-

ment. The market for mechanical presses, for example, is expected to more than double, rising from \$114 million in 1972 to \$253 million in 1978. Purchases of foreign-made mechanical presses should increase by 16% a year during the 1972-78 period, reaching \$132 million in the latter year from a base of \$47 million. Accessories for machine tools such as magnetic chucks, indexing heads, indexing tables, copying attachments, and hydraulic chucks are anticipated to provide good markets for American exporters in the near future. In addition, U.S.-made perishable tools (carbide-tipped, hard alloys) and metal cleaning equipment for use in foundries should be in demand.

The shortage of skilled labor in the Soviet Union has given strong impetus to the use of automated production methods, including numerically controlled (NC) machine tools. NC systems, relatively new to the Soviet market, are expected to show brisk sales throughout the remainder of this decade. Although efforts are underway to increase local production, estimated at 3,050 units in 1972, domestic output will still be insufficient to meet demand. Soviet users therefore are expected to fill much of their requirements for NC machinery from foreign manufacturers. American suppliers can expect extremely active U.S.S.R. interest in NC milling machines and NC boring machines, as well as NC machining centers.

The Soviets are striving to catch up with Western countries in technological advances in numerically controlled systems. Although the Soviets are striving toward full development of their own systems, based on the "Minsk" computers, they have not achieved the sophistication of equipment offered by Western industry and will continue to import this advanced machinery until the technological gap can be closed.

The market for numerical controls for retrofitting appears to be limited because Soviet purchasing tends to focus on equipping new plants rather than modernizing existing facilities. Demand for digital readouts should be somewhat stronger, although this market (like that of NC machinery for retrofitting) is somewhat hampered by the continued Soviet concern for complete installations.

Electrical discharge machines (EDM) and electrochemical machinery (ECM) processes have been well developed in the Soviet Union, and interest remains strong in finding more practical applications for these types of machining equipment. Imports of American-made EDM, particularly equipment for the manufacture of diesel valves, should reach substantial levels in the next few years.

End-User Industries

Since 1928 the Soviet Union has operated under a series of Five Year Plans designed to implement

economic development through industrialization. Steady emphasis has been placed on expansion of industrial materials and producer durables. In the 1960-72 period, these sectors received about 30% of total Soviet capital investment, compared to about 5% received by the consumer products sector. There has been a noticeable shift in priorities, however, and under the Eighth Five-Year Plan (1965-70), a new policy of increased emphasis on light industry and agriculture was begun with the hope of increasing consumer well-being.

The Ninth Five-Year Plan now in effect continues to stress consumer satisfaction as well as increased worker productivity, along with more efficient resource allocation. Investments by the most important end-user industries of metalworking and finishing equipment doubled from 1968 to 1973, and the continuing emphasis on augmenting output of consumer goods should result in further demands for machine tools.

The principal industry sectors using metalworking and finishing equipment recorded \$9.9 billion in capital expenditures in 1972 and \$68.5 billion in shipments (see table 4). Their capital expenditures are expected to increase by an average of 7.7% annually during the 1974-78 period, rising from an estimated \$13.8 billion to nearly \$19 billion (see table 5). Shipments in the same years are projected to climb from \$94 billion to over \$121 billion, representing a 6.4% yearly increase.

These projected increases in capital expenditures and shipments are attributable to large-scale investment programs, either already underway or being planned. Specific projects targeted for the current Plan period include mass production of automobiles, further mechanization of Soviet agriculture, and continued development of energy sources. Other projects that could heavily stimulate demand for metalworking equipment are new plants for making pipes for pipelines, the huge steel works at Kursk, new roller bearing factories, facilities for manufacturing earthmoving equipment, and additional factories for manufacture of consumer goods.

Major end-user firms and prospective customers in the U.S.S.R. for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, *Metalworking and Finishing Equipment—U.S.S.R.*, available for \$3.00 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230 or through your nearest U.S. Department of Commerce District Office. In addition to listing major prospective customers the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Table 4.—U.S.S.R.: Principal end-users of metalworking and finishing equipment, by industry sector, 1972

Sector	Shipments (in billions of U.S. dollars)	Capital expenditures (in billions of U.S. dollars)
Motor vehicles	16.33	2.17
Tractors and agricultural implements	9.07	1.69
Transport equipment (including rolling stock and shipbuilding) ..	7.26	1.21
Machine tools	3.38	.84
Energy and power equipment	2.78	.78
Electrochemical machinery	9.07	.76
Mining and metallurgical equipment	5.20	.75
Other metalwares	6.05	.60
Precision instruments	5.32	.58
Materials handling, construction, and construction material equipment	3.99	.52
Subtotal principal end-user sectors	68.45	9.90
Subtotal all other sectors	14.88	2.35
Total all end-user sectors	83.33	12.25

Source: U.S. Department of Commerce, Bureau of International Commerce, market research study. Values based on official U.S.S.R. statistics and trade source estimates.

Motor vehicles.—Soviet planners are giving priority treatment to upgrading and increasing production of motor vehicles, including passenger cars, trucks, motorcycles, and motor vehicle parts and accessories. In order to reach the manufacturing goal of 2.1 million vehicles annually by 1975, capital expenditures are expected to nearly double from \$1.55 billion in 1970 to over \$3 billion in 1974.

The major thrust of the expansion programs will be the attempt to meet the strong demand for automobiles and heavy trucks. A large automobile manufacturing plant at Togliatti was completed in 1972 with a capacity of 600,000 automobiles a year, but it is estimated that current production is on the order of only 400,000 to 500,000 units annually. The factory can be expanded to allow the production of 800,000 million units a year, but this will probably not be done until the end of the next Five-Year Plan.

A \$3-billion plant is now being built at Naberezhnye Chelny (the Kama River) where 150,000 trucks and 250,000 engines are to be manufactured annually. Imports of American machinery for this plant alone are expected to exceed \$350 million, including production equipment for cylinder blocks, crankshafts, pistons, wheels, and brake drums. The German company, Liebherr Verzhntechnik, was awarded a \$100-million contract for gear making equipment. The Kama River plant is expected to begin operation in the late 1970's.

Another substantial project now in the planning stages is a motorcycle factory, scheduled to begin production in 1975. Its annual output is expected to be around 100,000 vehicles, and requirements for capital equipment are estimated at \$100 million.

A new plant for the production of gas engines is also planned. This project reportedly will involve investment of \$300 million and will produce 500,000 six-cylinder engines annually for the medium-size passenger car "Volga." The car's new features will include an engine with 130 hp. to 150 hp. (as opposed to the present 98-hp. engine) and new brake and axle systems.

A factory for the production of 16-ton trucks on the scale of the Kama River Project is being discussed. About 20 new truck models will be constructed under the current Development Plan. They include three-axle 8-ton trucks and truck-trailer rigs with capacities of 15, 25, and 35 tons; dump trucks with a capacity of 75 tons; coal-hauling trucks; motordriven vehicles for underground operations, and trucks for arctic and tropical climates; and self-dumping tandem hoppers with capacities up to 120 tons for the mining industry.

Other plans include the upgrading of the Moscow and Gor'kiy motor vehicle plants, achievement of full capacity at the Volzhskiy, Izhevsk, Ul'-yanovsk, and Zaporozh'ye plants, and expansion of the Leninsky Komsomol factory in Moscow. Branches of the Likhachev Works, which produces automobiles in Moscow, are to be established at Chernigov and Arsamas, and a motor factory is to be built at Chita.

The motor vehicle industry purchased \$1.09 billion of metalworking and finishing equipment in 1972 and purchases are estimated at \$1.53 billion in 1974; an increase to \$1.8 billion is projected for 1978. The number of new machine tools installed during the 1971-72 period amounted to 40,000 units. In 1973 the planning goal was the installation of 25,000 machine tools, plus 175 automatic and 114 mechanized production lines.

Soviet motor vehicle manufacturers rely heavily on Western suppliers. Over 60% of all MFE imports, and 80 to 90% of the metalworking and finishing equipment used at the Kama plant, will be bought from the West. U.S. products that should be in demand over the next several years include the following:

- Gear making machines
- Automatic presses
- Grinders
- Deburring equipment

Tractors and agricultural implements.—Under the current Five-Year Plan, manufacturers in the Soviet Union are slated to increase production of tractors and agricultural implements from \$2.55

billion in 1970 to \$5.1 billion in 1975. Output of tractors alone is scheduled to expand to 575,000 units annually. Priority has been given to augmenting production of equipment for animal husbandry, and a special ministry was formed to oversee development of more than 100 new types of machinery (milking and livestock feeding machinery, etc.).

In order to improve and expand production in this sector, capital expenditures are projected to climb from about \$2.5 billion in 1974 to \$3.6 billion in 1978. One of the largest new investment projects under the 1976-80 development plan is the expected construction of a new tractor manufacturing plant, which will probably be built at Chelyabinsk. Meanwhile, the tractor plant at Cheboksary is undergoing a major expansion. The coming Five-Year Plan (1976-80) envisions the production of a total of 3 million tractors.

Through purchases of metalworking and finishing equipment from foreign suppliers, the industry hopes to incorporate the latest Western technology. MFE purchases are expected to increase by almost 18% annually during the 1972-78 period, rising from \$181.5 million to \$556 million. Specific products in demand from American manufacturers include the following:

- Gear making equipment
- Precision grinders
- Hydraulic presses
- Mechanical presses
- NC lathes
- Turret lathes
- Milling machines
- Boring machines

As in the automotive industry, manufacturers of agricultural machinery will give priority to buying gear making machinery. Special-purpose machines and production lines for motor parts will follow in the order of priority items.

Machine tools.—This sector, which manufactures metalworking and finishing equipment, woodworking machinery, and some equipment for the plastics industry, is expected to raise the value of its shipments from \$3.3 billion to \$4 billion from 1970 to 1975. Capital expenditures have increased markedly; they climbed from \$633 million in 1970 to an estimated \$1.2 billion in 1974 and should reach nearly \$1.7 billion in 1978. Two new factories were recently built in Sassovo and Baranovich. About 75% of the sector's investments are for the establishment of new production capabilities, and the remainder is for modernization of existing plants.

The Soviet machine tool industry is particularly interested in numerically controlled (NC) machine centers and NC machine tools of all kinds, as well as in precision instruments. Demand is keen for American-made NC systems for integration into its own installations. The sector, presently accounting

Table 5.—U.S.S.R.: Capital expenditures of principal end-users of metalworking and finishing equipment, 1970, 1974 and 1978

(in millions of U.S. dollars)			
Sector	1970	1974	1978
Motor vehicles	1,554	3,058	3,892
Tractors and agricultural implements	1,332	2,502	3,614
Transport equipment	955	1,668	2,224
Machine tools	633	1,182	1,668
Energy and power equipment	611	1,084	1,529
Electrotechnical equipment	577	1,043	1,390
Mining and metallurgical equipment	611	973	1,251
Other metalwares	466	834	1,112
Precision instruments	444	806	1,043
Materials handling, construction, and construction material	389	695	904
Total	7,572	13,845	18,627

Source: U.S. Department of Commerce, Bureau of International Commerce, market research study. Values based on official U.S.S.R. statistics and trade source estimates.

for 5% of all MFE imports from Western countries, should continue to be a major user of foreign-made equipment. Its purchases are projected to more than double during the 1972-78 period, increasing from \$145.2 million to \$292 million.

Power generating equipment.—This sector manufactures all types of equipment for the generation of electric power, including steam boilers and boiler equipment; steam, gas, and hydraulic turbines and equipment; nuclear power reactors; stationary diesel and steam engines; and wind-powered machinery. The rapidly rising energy needs of Soviet industry have brought about substantial increases in the production of electric power; production by 1975 is to reach 1,065 billion kilowatts (kw.) of electric power, a 44% rise over the 1970 level. Increased investment in this sector is not only in response to domestic demand, but for export as well. The sector's shipments grew from \$2.7 billion in 1970 to approximately \$3.9 billion in 1974 and should exceed \$5 billion in 1978.

Capital expenditures, which rose from \$611 million in 1970 to an estimated \$1.1 billion in 1974, are anticipated to top \$1.5 billion in 1978. Major investments will be made to expand the capacity of existing plants, including the Electro-Machine-Building Works at Dnepropetrovsk, Zaporozh'ye, Kishinev, and Novaya Kakhovka. Factories in Leningrad and Kharkov will also be enlarged.

The sector's purchases of metalworking and finishing equipment are expected to climb from \$60.5 million in 1972 to \$111 million in 1978, representing a better than 8% yearly rise. The industry has used relatively little American machinery to date,

but there is now interest in the following types of MFE from the United States:

- Special lathes for assymetric work pieces
- Copy-milling and boring machines
- Special honing machines for turbine parts
- NC machining centers
- Cleaning equipment for the cutting of casting fillers

Soviet technology in the generation of power is considered to be highly advanced. The trend is toward larger power stations, with the world's largest power unit currently under construction. Standard equipment in the future is to consist of 800-MW units, as compared with present minimum capacities of 300 MW.

Transport equipment.—This sector includes enterprises that manufacture railroad, subway, and streetcar rolling stock and operating equipment, and ships and boats of all types. Expanding production of transport equipment is considered vital to the continued development of the Soviet economy. Capital expenditures during the 1974-78 period are expected to increase from nearly \$1.7 billion to over \$2.2 billion, while shipments for the same years are projected to rise from \$10.1 billion to \$12.5 billion.

During the Five-Year-Plan now in effect, output of railroad freight cars and locomotives is slated to expand by 60%, and a further increase of 25 to 30% should be achieved by 1978. The largest investment project currently underway in this industry is a plant for the production of rolling stock in Abakan. Its annual capacity is planned to reach 40,000 freight cars of 25-ton size, considerably increasing the country's present annual production of 80,000 cars.

During the next Five-Year-Plan, one of the most important projects will be the building of a large shipyard for supertankers near Odessa on the Black Sea. Investments for this project alone are expected to total \$1.4 billion.

Manufactures of transport equipment expended \$42.4 million on metalworking and finishing equipment in 1972. Purchases are projected to rise by almost 14% annually from 1974 to 1978, increasing from about \$83 million to nearly \$140 million. In addition to foundry and pertinent metal cleaning and finishing equipment, interest is strong in the following types of machinery from U.S. suppliers:

- Precision turret lathes
- Precision milling machines
- Precision boring machines
- Inertial welding machines
- EDM and ECM machines
- Machining centers
- Presses
- Punches

Domestic Manufacture of Metalworking and Finishing Equipment

The Soviet Union has succeeded in building up a strong machine tool industry capable of meeting

much of the nation's needs for high-output equipment, and some 200 factories now manufacture metalworking and finishing equipment. Their combined production is expected to more than double during the 1972-78 period, expanding from \$2.7 billion to nearly \$6 billion.

The Ministry of the Machine Tools and Tool Industry coordinates and controls most of the factories producing metalworking and finishing equipment. The most important department within the Ministry is Glavsnab. This department is charged with the flow of raw materials to the machine tool industry and for the distribution of such machinery to Soviet industry. The Department for Projections and Investments is concerned with the determination of new production facilities and/or the expansion of existing plants.

Under the Eighth Five Year Plan (1965-70), Soviet machine tool builders made good progress in the types of tools fabricated. The number of models of metal cutting machine tools grew from 1,220 in 1965 to 1,800 in 1970; the increase was twofold for forging and pressing equipment and 90% for foundry equipment. Production of metal finishing equipment increased 25% during the 1965-70 period, and the output of high-precision machine tools grew 57%.

The current Five-Year Plan is directed toward raising the quality, rather than the volume, of MFE production. Manufacturers have concentrated their efforts in the past on the mass production of relatively inexpensive items. For example, the Moscow-based Krasnyy Proletariy works produces 13,000 lathes annually at a cost said to be half that of comparable Western products. Factories are now being encouraged to develop more precision machinery, single-purpose machines, numerically controlled systems, and sophisticated automatic forging hammers. In addition, Soviet planners are trying to shift casting operations away from individual factories to centralized facilities in order to upgrade quality.

Soviet goals under the present Plan include the manufacture of lathes capable of speeds up to 60 to 70 m/min, and grinding machines capable of 60 to 70 m/sec speeds. Milling machines made of high alloy steel should be fabricated to reach 50 to 70 m/min, and those of hard alloy steel, 150 to 200 m/min. Numerically controlled machine tools are being designed in the direction of automated tool changers and work-holding devices. Future research and development projects will emphasize the construction of machines for advanced technological processes. Such equipment as precision cutters, mills, cold overpressing and compressing machines, and punch forging equipment at high speeds will receive priority treatment.

Under cooperation and specialization agreements, within the framework of the Council for Mutual Economic Assistance (CMEA), the U.S.S.R. and

other Socialist countries are working toward an agreed division of labor in the production of machine tools as well as a standardized system of numerical program control and a standard language for machine programming. East Germany, Czechoslovakia, and, increasingly, North Korea, are sizable exporters of metalworking and finishing equipment to the U.S.S.R. These contracts, however, draw heavily on the productive capabilities of Eastern European countries and will not be capable of fully satisfying Soviet demand for imported MFE in the foreseeable future.

In addition to close cooperation between Soviet and other Socialist countries in the production of MFE under CMEA, the Soviet Union has a number of technical agreements with Western firms. Gildmeister, Siemens, and Liebherr of Germany, as well as Alcatel, Amtec, and Renault of France, are major Western partners. Most of these agreements involve the export of Soviet machinery; for example, Soviet-made machinery is being equipped with French and German controls for the international market.

Soviet exports of MFE amounted to \$196 million in 1972 and should exceed \$560 million in 1978. In addition to the agreements with foreign concerns mentioned above, the Soviets are establishing trading organizations in Western countries and are staging industrial exhibitions abroad. Despite these efforts, however, the country's original long-term planning goal of exports surpassing imports by 1980 is not likely to be realized.

Trade Regulations and Practices

Foreign trade in the Soviet Union is a state monopoly administered by the U.S.S.R. Ministry of Foreign Trade. The Ministry supervises and controls the activities of approximately 50 specialized All-Union Foreign Trade Organizations (FTO's), each of which is responsible for the export and/or import of a particular group of commodities or services. The FTO's carry out the actual purchase of foreign goods and the sale of Soviet products abroad and have the exclusive right to trade with other countries in their particular product categories.

The three trade organizations concerned with metalworking and finishing equipment are Stankoimport, Avtopromimport, and Metallurgimport. Avtopromimport was founded to procure equipment for large projects in the automotive field, while Metallurgimport buys mainly foundry and metal cleaning equipment for use in foundries.

Although the FTO's handle commercial negotiations and conclude contracts with foreign firms, the actual purchasing decisions are normally made by the end-users themselves, often in consultation with the State Committee for Science and Technology. Recommendations of the Committee on the import of sophisticated technology and equipment are most

often considered final and binding. While there are duties assessed on imports by the U.S.S.R., the tariffs have little apparent impact on purchasing decisions.

A U.S. businessman who wishes to establish Soviet business contracts may write directly to the appropriate FTO headquarters in Moscow. It may also be advantageous to contact Soviet commercial representatives in the United States to obtain a preliminary indication of Soviet interests and to identify the persons or organizations to contact in the U.S.S.R. The following Soviet offices deal with commercial matters: The Office of Trade Representative of the U.S.S.R., 1521 16th Street, N.W., Washington, D.C. 20009; The Amtorg Trading Corporation, 355 Lexington Avenue, New York, New York 10017; and The Kama Purchasing Commission, General Motors Building, 767 Fifth Avenue, 6th Floor, New York, New York 10022. The latter organization functions as a channel to the FTO's involved in the procurement of automotive projects.

Additional information concerning trade with the U.S.S.R. may be obtained from the Bureau of East-West Trade, Trade Assistance Division, Room 4816 Main Commerce Building, U.S. Department of Commerce, Washington, D.C. 20230. The expanded commercial office of the U.S. Embassy in Moscow is prepared to assist U.S. businessmen in the U.S.S.R. with a broad range of business services.

Since certain items of MFE, particularly sophisticated equipment, are subject to U.S. export controls, exporters are encouraged to contact the Exporter's Service Section, Office of Export Administration, BEWT, Room 1613, Main Commerce Building, regarding possible or pending transactions.

Technical Requirements

Standards in the Soviet Union are issued by the Council for Standards, Measurements, and Measuring Instruments of the Council of Ministers of the U.S.S.R. American standards are generally acceptable.

The electric power supply characteristics in the Soviet Union are 110, 127, and 22 volts AC, 50 cycles. The metric system of weights and measurements is used exclusively throughout the country. Published national standards for metalworking and finishing equipment in the U.S.S.R. may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

The following market research study, which this Country Market Survey summarizes, is available on loan from the U.S. Department of Commerce, Domestic and International Business Administration, Room 1617-M, Main Commerce Building, Washington, D.C. 20230: "The Market for Metalworking and Finishing Equipment in the U.S.S.R." DIB 74-10-516, May 1974.

Appendix

The following table contains additional information for the U.S. businessman who is considering selling his products in the U.S.S.R. The table below gives the value in U.S. dollars of various items of metalworking and finishing equipment imported by the U.S.S.R. in 1968, 1970, and 1972. In addition, projections are made for the years 1974, 1976, and 1978.

U.S.S.R.: Imports of metalworking and finishing equipment, 1968-78 alternate years

(in millions of U.S. dollars)

Type of Equipment	1968	1970	1972	1974	1976	1978
<i>Metal cutting machine tools:</i>						
Lathes, turret lathes	37	43	94	188	258	360
Milling, boring, drilling machines	27	33	70	128	178	247
Grinding, honing, lapping machines	24	32	80	160	221	307
Gear making machines	15	24	56	118	163	227
Shaping, slotting, broaching machines	4	6	11	18	24	33
Other metal cutting machine tools	13	17	39	83	115	160
Total	120	155	350	695	959	1,334
<i>Metal forming machine tools:</i>						
Mechanical presses	11	21	47	71	104	132
Hydraulic presses	2	3	4	7	10	11
Automatic pressing and forging machines	2	14	24	42	61	78
Hammers, bending, straightening machines	4	7	8	15	21	28
Metal shears	9	7	6	8	13	15
Other metal forming machines, including MF transfer lines	18	33	45	65	97	125
Total	46	85	134	208	306	389
<i>Other metalworking equipment:</i>	7	9	21	46	81	110
<i>Parts, accessories, tools and dies:</i>						
Parts and accessories for machine tools	9	11	19	33	47	63
Tools and dies for machine tools	8	11	21	31	36	42
Total	17	22	40	64	83	105
<i>Metal finishing equipment:</i>	6	7	15	21	29	38
Total metalworking and finishing equipment	196	278	560	1,034	1,458	1,976

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on official U.S.S.R. statistics and trade source estimates.



Country Market Briefs

Abbreviated surveys of six additional country markets for selected groups of electronic components are contained in this section. These *Country Market Briefs* are based on reports prepared by the commercial sections of the U.S. Embassies in the countries surveyed.

The *Briefs* include information similar to that contained in the *Country Market Surveys* and, to the extent possible, follow the same format.

Austria

The Austrian economy has been booming since 1967. Gross national product (GNP) grew at an average annual rate of over 12%¹ from 1968 to 1974, reaching \$34.6 billion.² During those years, both the private and public sectors invested heavily in capital equipment to raise output and meet the rapidly growing demand for Austrian products at home and abroad. Capital investment as a whole expanded at the rate of 22% annually from 1968 to 1972 and then at 7.5% a year through 1974. The

market for metalworking and finishing equipment (MFE) grew even more rapidly between 1968 and 1972, with an annual growth rate of 32% (see table 1). It reached \$92.9 million in 1972 and \$131 million in 1974.

The outlook for expansion in the near future is less optimistic, due to the slump in economic activity abroad and the rising inflation in the Austrian economy. A 12% tax on new investment which went into effect at the beginning of 1973 also is expected to slow capital expenditures until the tax is phased out at the end of 1977. Nevertheless, the need to automate production processes to neutralize rapidly rising labor and raw material costs is anticipated to continue, pushing expenditures on metalworking and finishing equipment upward at the rate of about 7% annually through 1978.

¹ In order to present a more accurate picture, growth rates have been calculated from local currency values. This eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

² The following exchange rates have been used to convert Austrian shillings into U.S. dollars: 1968-70, 26.00; 1971, 24.90; 1972, 23.30; and 1973-78, 19.60.

Table 1.—Austria: Consumption of metalworking and finishing equipment 1968, 1972, 1974, and 1978
(millions of U.S. dollars)

Year	Metal cutting machine tools	Metal forming machine tools	Machine tool parts, dies, etc.	Metal finishing equipment	Other metalworking equipment	Total
1968						
production	9.9	7.1	13.8	6.7	2.2	39.7
imports	9.3	5.4	5.8	4.2	1.7	26.4
exports	9.0	8.1	10.1	2.3	2.0	31.5
consumption	10.2	4.4	9.5	8.6	1.9	34.6
1972						
production	22.8	12.5	26.7	10.4	2.7	75.1
imports	29.3	21.4	13.7	8.7	5.7	78.8
exports	23.6	11.0	17.7	4.1	4.6	61.0
consumption	28.5	22.9	22.7	15.0	3.8	92.9
1974						
production	—	—	—	—	—	—
imports	—	—	—	—	—	—
exports	—	—	—	—	—	—
consumption	38.0	29.0	34.0	26.0	4.0	131.0
1978						
production	—	—	—	—	—	—
imports	—	—	—	—	—	—
exports	—	—	—	—	—	—
consumption	49.0	39.0	44.0	34.0	5.0	171.0

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Austrian official trade statistics and local trade source estimates.

Table 2.—Austria: Imports of metalworking and finishing equipment, 1968-72
(in millions of U.S. dollars)

Equipment	1968	1972
<i>Metal cutting machine tools</i>		
Turret and automatic lathes	1.5	4.9
Other metalworking lathes	0.9	3.8
Metalworking milling machines	2.3	5.8
Planing, slotting and broaching machines	0.3	0.5
Grinders and grinding machines	2.4	7.5
Drilling and tapping machines	0.9	4.0
Sawing and filing machines	0.6	1.7
Hobbing machines	0.0	0.1
Other metalcutting machines	0.4	1.0
Total	9.3	29.3
<i>Metal forming machine tools</i>		
Plate bending and forming machines	0.9	3.1
Hammer, forge, strike, tilt machines, incl. riveting, bending and straightening machines; draw benches	0.1	0.2
Metalworking presses	0.9	4.6
Wire forming and processing machines	0.5	1.8
Other metal forming machines	3.0	11.7
Total	5.4	21.4
<i>Other metalworking machine tools</i>		
Autogenous welding, cutting and surface hardening equipment	0.2	0.7
Electric welding machines and equipment	1.5	5.0
Total	1.7	5.7
<i>Machine tool parts, accessories, tools and dies</i>		
Chucks for lathes	0.1	0.2
Chucks for other machine tools	0.1	0.2
Other clamping, fastening and stretching devices, die heads, dividing heads, etc.	1.5	3.8
Torches for autogenous welding, cutting and surface hardening	0.1	0.5
Metal cutting tools for MT's	1.4	3.4
(milling cutters, drills, etc.)		
Other exchangeable tools for MT's	1.8	3.7
(diamond cutters, draw plates, etc.)		
Machine knives	0.8	1.9
Total	5.8	13.7
<i>Metal finishing equipment</i>		
Metal parts cleaning equipment	0.4	1.2
Metal parts deburring equipment	0.2	0.4
Metal parts hardening equipment	0.6	1.1
Metal parts plating equipment	1.4	3.2
Metal parts painting equipment	1.6	2.8

Table 3.—Austria: Imports of metalworking and finishing equipment by country, 1972
(in millions of U.S. dollars)

Equipment	United States	Germany	United Kingdom	Japan	Italy	Total Imports
Metal cutting machine tools	0.70	16.27	1.10	0.17	2.21	29.30
Metal forming machine tools	1.06	12.89	1.52	0.05	0.74	21.40
Other metalworking equipment	0.04	2.50	0.19	—	0.58	5.70
Subtotal, metalworking equipment	2.80	31.66	2.81	0.22	3.53	56.40
Machine tool parts, accessories, etc.	0.31	8.78	0.62	0.23	0.29	13.70
Metal finishing equipment	0.69	5.02	1.23	0.25	0.41	8.70
Total	3.80	45.46	4.66	0.70	4.23	78.80

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Austrian official trade statistics.

Total	4.2	8.7
Total metalworking and finishing equipment	26.4	78.8

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Austrian official trade statistics.

Austrian consumption of metal cutting machine tools in 1972 was \$28.5 million and was supplied almost entirely by imports. Over the past 2 years, purchases grew at an average rate of 15.5% to \$38 million and are expected to reach almost \$50 million in 1978. Metal forming machine tool purchases are projected to reach close to \$40 million in 1978, up 34% from the 1974 total of \$29 million.

The trend toward production of more sophisticated finished metal products has greatly stimulated demand for metal finishing equipment. Expenditures on this machinery rose at the substantial rate of 32% annually between 1972 and 1974, reaching \$26 million in the latter year. The 1978 market is anticipated to total \$34 million.

Imports of metalworking and finishing equipment totaled \$78.8 million in 1972 (see table 2). Much of the advanced equipment Austrian industrialists are expected to purchase in the next several years is not manufactured domestically. Imports therefore are expected to continue to rise at an annual rate of 8 to 10% through 1978.

Germany supplies almost 60% of Austria's MFE imports (see table 3). Switzerland is the second largest supplier, with 10% of the import market, followed by the United Kingdom (6%), Italy (5%), and Sweden and the United States with 4% each. The market shares are not expected to change substantially over the next few years, although Italy, Japan (which now has a share of 1%), and the United States may succeed in improving their respective market positions.

German and Swiss suppliers can depend on their long-established relationships with local importers and end-users, their proximity to the Austrian market, and their common language and technical standards to help maintain their share of the market.

British and Italian producers have been partially successful in increasing sales to Austria. Recently, however, they have been plagued with rising costs

and persistent labor troubles which have made it difficult for them to fill orders. U.S. manufacturers of metalworking and finishing equipment have the advantage of being able to market some of the most technologically advanced machinery available to the Austrians.

Sales Opportunities

Austrian metalworking enterprises are interested in automatic, versatile equipment which can be easily adapted to a wide range of operations. Since they produce a great variety of goods in relatively short series, highly specialized machinery is unprofitable to them. End-users insist, however, on purchasing equipment which incorporates the newest technology. They are expected to purchase metalworking and finishing machinery over the next few years primarily to replace their obsolete equipment. Outlays intended to expand capacity should step up after 1976.

The following items have been identified by the commercial section of the U.S. Embassy in Vienna as having the best sales potential:

- Numerically controlled machines
 - boring
 - drilling
 - milling
 - bending
 - press brake/hydraulic
 - horizontal and vertical lathes
 - machine centers
- Numerical controls
- Grinding machines
 - plain and plunge, external
 - centerless internal
 - cam and cam shaft
 - crank shaft
 - double disk
 - reciprocating and rotary table vertical spindle
 - tap
 - twist drill
- Turret head drilling machines
- Forging machines
- Hydraulic and mechanical presses
- Counterblow hammers
- Roll forging machines
- Horizontal bar multispindle turning machines
- Metal parts deburring equipment
- Thread rolling machines
- Bolt, nut, screw, and rivet making machines
- Diesinking machines
- Bevel gear cutting machines
- Index type and rotary table assembly machines
- Conventional layout machines

End-User Industries

There were over 1,500 manufacturers using metalworking and finishing equipment in Austria in 1970 (see table 4). They employed over 200,000 workers, and their total sales reached more than \$3.3 billion. The principal industries which use MFE are expected to increase expenditures for capital equipment at an

Table 4.—Austria: End-users of metalworking and finishing equipment, by industry, 1970

	Number of Manu- facturers	Value of Sales (in millions of dollars)	Value of Capital Expenditure (in millions of dollars)	Number of Workers
Steel & non-ferrous				
metals	179	1,258.5	53.2	62,696
Electrical products	212	538.4	25.6	33,747
Machines	387	387.0	22.9	28,922
Finished metal goods	339	292.8	14.8	20,282
Transport equipment	157	477.8	11.4	28,488
Semi-finished metal				
goods	157	237.6	8.7	19,002
Instruments, watches, jewelry	51	55.9	2.7	3,553
Musical instruments, toys, sporting goods	34	53.8	2.0	3,220

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Austrian official trade statistics.

annual rate of almost 9% through 1978 compared to a rate of 6.7% from 1970 to 1974 (see tables 5 and 6). Capital outlays, which should reach over \$90 million in 1978, will be made primarily for more efficient and advanced machinery to increase the productivity of existing facilities. However, some manufacturers, particularly those in the State-owned industries, intend to add product lines, including non-ferrous metal and wire products and advanced machine tools, if it can be determined that economic conditions will allow for their profitability. Capital expenditures then would be higher than currently projected.

The Austrian Government provides a number of incentives for capital investment. These include: tax exemption on profits set aside for investment purposes; special depreciation allowances on newly acquired capital goods (100% of the value could be written off in 1974); tax reductions on capital goods used to produce for export; and low interest loans for financing investment in certain industrial sectors. The government subsidizes some research and development, but funds available for that purpose are limited (\$15 million was allocated in 1974). Industry organizations assist member firms in financing selected R & D projects.

Major Austrian prospective buyers for metalworking and finishing equipment are contained in the U.S. Department of Commerce publication, Target Market Trade List, Metalworking and Finishing Equipment—Austria, available for \$3 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest District Office. In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications and trade associations.

Table 5.—Austria: Principal end-users of metalworking and finishing equipment, by industry sector, 1970

	Number of Manu- facturers (in millions of dollars)	Value of Sales	Value of Capital Expenditure
Fabricated structural metal products	103	217	7.3
Iron, steel, and non-ferrous metal foundries	93	130	7.2
Motor vehicles and parts	40	198	5.7
Radio and TV receivers	19	168	4.8
Cutlery, hand tools, hardware ..	68	69	4.5
Armatures, fittings, bearings	39	83	4.3
Electric motors, generators, etc.	31	125	4.2
Insulated cables, wires, etc.	18	90	4.2
Miscellaneous electrical products	59	172	4.0
Metal and woodworking machinery	45	66	3.9
Subtotal, principal sectors	515	1,318	50.1
Subtotal, all other sectors	1,001	1,984	91.2
Total, all end-users	1,516	3,302	141.3

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Austrian official trade statistics.

Domestic Manufacture of Metalworking and Finishing Equipment

Austrian metalworking and finishing equipment manufacturers produced \$75 million worth of machinery in 1972, almost double the 1968 total of \$39.7 million. Approximately 20 firms manufacture MFE and produce a wide range of equipment, including lathes; milling, drilling, tapping, plate bending, and forming machines; presses; planing, slotting, hammer and forging machines; and tools for machine tools.

Most of the equipment produced in Austria is of good quality and more or less conventional. Three firms manufacture relatively sophisticated metalworking equipment and account for over 80% of domestic production. Maschinenfabrik Heid AG (HEID), which produces a wide range of lathes and other turning machines, had a total output of nearly \$15 million in 1972. Gesellschaft fuer Fertigungstechnik und Maschinenbau AG (GFM) produced \$23 million of precision and continuous forging machines and crankshaft milling machines in the same year; and Voest-Alpine AG manufactured a variety of heavy presses and shears, lathes, and roll grinding machines totalling \$27 million.

Though there are currently no definitive plans to greatly increase output, manufacturers are seeking to incorporate higher technology into their products and to further improve their overall quality and performance. Voest-Alpine, HEID, and Simmering-Graz-Pauker have licensing and other technical agreements with foreign firms for the manufacture of numerically controlled machinery. All three are interested in fur-

ther licenses to manufacture even more advanced equipment.

No Austrian firm has entered a joint venture with a U.S. or other foreign company for the manufacture of metalworking and finishing equipment. There are also no Austrian manufacturing subsidiaries of U.S. firms. Two companies in Austria are owned by German firms. Maschinenfabrik Koenig & Bauer AG is a subsidiary of Schnellpressenfabrik Koenig & Bauer of Wuerzburg, Germany. It produces printing machines, centerless cylindrical grinders, precision tapping machines, and precision bench drilling machines. Over 80% of its output is exported, mainly to Germany and East European countries. The other German subsidiary, Langbein-Pfauhauser Werke AG, manufactures grinding machines and metal finishing equipment, including electrochemical machines and galvanizing equipment. About two-thirds of this production is exported.

Trade Regulations and Practices

U.S.-made metalworking and finishing machinery imported into Austria is subject to most-favored-nation (MFN) treatment. Customs duties average 12% of the cost, insurance, and freight (c.i.f.) value at the Austrian border. Some equipment, particularly the heavier pieces, is assessed at specific rates which range from US\$0.04 to \$0.06 per net pound. Customs duties can be waived or reduced if a product is not manufactured in Austria or if domestic production does not meet demand. It is anticipated that these tariff cuts will be liberally granted to reduce the cost of capital goods urgently needed to improve the productivity of Austrian industry.

Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Office of International Marketing, Main Commerce, Washington, D.C. 20230.

Table 6.—Austria: Capital expenditures of principal end-users of metalworking and finishing equipment, 1970, 1974, 1978
(in millions of dollars)

Sector	1970	1974	1978
Fabricated structural metal products	7.3	9.5	13.0
Iron, steel, and nonferrous metal foundries	7.2	8.5	12.0
Motor vehicles and parts	5.7	8.0	10.0
Radio and TV receivers	4.8	6.8	9.0
Cutlery, handtools, hardware	4.5	7.0	9.0
Armatures, fittings, bearings	4.3	6.5	8.0
Electric motors, generators, etc.	4.2	6.3	8.0
Insulated cables, wires, etc.	4.2	6.0	7.0
Miscellaneous electrical products	4.0	6.2	8.0
Metal and woodworking machinery	3.9	5.5	7.0
Total	50.0	70.3	91.0

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Austrian official trade statistics and trade source estimates.

Austria is a member of the European Free Trade Association (EFTA) and allows imports from present and former member countries—Switzerland, Sweden, Norway, Portugal, Finland, Iceland, the United Kingdom, and Denmark—to enter free of duty. Imports from the members of the European Economic Community (EEC) are subject to customs duties which are 40% lower than the MFN rates. All duties on goods originating in the EEC will be eliminated by January 1, 1977.

A 16% turnover tax is levied on the c.i.f. Austrian border value plus duty of all imports. Automatic and informal import licenses are issued by the Austrian customs houses when goods cross the border. Foreign exchange to import metalworking and finishing equipment also is made available automatically by the Austrian National Bank. No authorization or license is required.

Sales of machine tools and other metalworking and finishing equipment are handled by over 60 firms in Austria through agency and distributorship arrangements with both domestic and foreign manufacturers. There are about a dozen large firms, all located in Vienna. Most cover the entire Austrian market and frequently cover neighboring markets in Eastern Europe. The import and sale of heavy machinery is generally done on a commission basis (the fee is between 8 and 10%); firms handling smaller machines and tools, usually represent a foreign supplier only if he grants them exclusive rights. Most firms, particularly the larger ones, are willing to consider new manufacturers but generally are working at full capacity. Trade sources consider establishment of a sales and service subsidiary to be the best means of entering the Austrian and neighboring markets at the present time. This is particularly true if the equipment to be sold is very sophisticated.

Warehousing and service facilities in Austria are generally adequate. Financing can be a problem because capital is in relatively short supply and end-

users prefer long payment terms (up to 2 years for the more expensive pieces of equipment).

Technical Requirements

Manufacturers and users of metalworking and finishing equipment in Austria must comply with the regulations set forth in the following laws:

General Rules for the Protection of Workers (*Allgemeine Dienstnehmerschutzverordnung*), published in Federal Law Gazette #32/1962;

Machine Safety Ordinance (*Maschinenschutzverordnung*), published in Federal Law Gazette #43/1961;

Federal Law Concerning the Safety and Standardization of Electrotechnical Equipment and Installations (*Elektrotechnikgesetz*), published in Federal Law Gazette #57/1965.

The issuing and regulatory organizations are: the Federal Ministry for Trade, Commerce, and Industry, Stubenring 1, A-1010 Vienna; the Austrian Institute for Standardization, Leopoldgasse 4, A-1020 Vienna; and the Electrotechnical Testing Institute, Arsenal, Objekt 221, A-1030 Vienna.

U.S.-made machinery complying with MTTA standards is acceptable in Austria. The metric system of weights and measures is used. The electrical power supply is 380 volt, 50 cycles, 3-phase, 4 or 5 wires; DIN plugs are used.

There are no specific marking or labeling requirements for metalworking and finishing equipment. Operational instructions of machinery and equipment should be in German.

Published national standards for metalworking and finishing equipment in Austria may be obtained through the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

The market research study, on which this Country Market Brief is based is "The Market for Metalworking and Finishing Equipment in Austria," DIB 74-11-505.

India

While domestic problems, compounded by increased costs of imported petroleum, fertilizers and other essential commodities, slowed the overall pace of Indian economic development in 1974, the outlook is more encouraging for major industrial sectors which constitute primary metalworking and finishing equipment (MFE) end-users. Consumption of MFE grew at an average annual rate of 8.4% during the 1968-72 period¹, climbing from \$110 million to \$152 million. The market is expected to maintain approximately the same growth during the 1974-78 period, reaching a volume of over \$347 million in 1978 (see table 1).

The value of MFE imported by Indian industry averaged about \$46 million annually between 1968 and 1972. It is expected to reach the \$51 million level in 1974. During 1968-72, while both domestic production and exports of MFE increased, imports declined slightly. In 1972 MFE imports, including parts and accessories, totaled \$49.6 million (see table 2). Production was valued at \$107.2 million, while exports were \$4.8 million.

The total number of machine tools installed in the country at the end of 1972 was 270,029. Of this number 97,156 (36%) were between 6 and 10 years old. The government-sponsored Working Group on Machine Tools in India has estimated India's annual demand for machine tools at 30,200 units by 1978.

Traditional sources of imported metalworking equipment have been West Germany, the United States, the United Kingdom, Japan, Italy, and Switzerland. Recently the U.S.S.R., Czechoslovakia, and other Eastern European countries have made significant inroads into the market.

The market share of imports from Germany, United States and United Kingdom fluctuated widely during recent years. With the exception of 1968, when the United States was by far the largest supplier, Germany led the market until 1972 (see table 3). The market shares of the three largest suppliers during

Table 1.—India: Consumption of metalworking and finishing equipment 1968-78, alternate years
(in millions of U.S. dollars)¹

Type of Equipment	1968	1972	1974	1976	1978
Metal cutting					
machine tools	41.4	52.6	70.5	100	130.5
Metal forming					
machine tools	13.0	9.4	13.0	14	20.0
Other metalworking					
machine tools	5.2	8.6	12.0	13.2	19.5
Other metalworking					
equipment	9.0	18.3	18.5	19.3	29.0
Parts & accessories for					
machine tools	12.5	18.6	22.5	25.5	37.0
Tools & dies for					
machine tools	28.0	42.5	57.5	76.5	106.0
Metal finishing equipment	0.9	2.0	3.0	4.0	5.5
Total consumption	110.0	152.0	197.0	252.5	347.5

¹ Consumption equals production plus imports minus exports.

Source: Based on Indian Planning Commission's Draft Fifth Five-Year Plan (1974-79) and trade source estimates.

1972 were as follows: Germany (18.9%), United Kingdom (16.2%), United States (9.8%). For the near future, metal cutting machine tools have the best sales potential. U.S. exports of this equipment could more than double. Substantial increases in other categories of metalworking equipment are also possible. Specifically, 1976 forecasts give U.S. suppliers 13% of metalcutting equipment sales, 24% of metal forming equipment sales, 26% of the parts and accessories, and 22% of the tools and dies market. The market shares of other traditional suppliers (except the United Kingdom) will probably decline.

There is a very strong "buy national" policy. Every possible encouragement is provided to local manufacturers of machine tools. Foreign exchange in India's planned economy is sectorially allocated, and the machine tool industry is accorded a "priority" status.

India is making concerted efforts to earn foreign exchange through vigorous export plans. However the country's ability to export and to earn foreign exchange will probably not keep up with its growing import bill. British, German, and Italian credits are

¹ All dollar values and growth rates are based on a constant exchange rate of Rs 7.50 = US\$1.

Table 2.—India: Imports of metalworking equipment,
1968-69 and 1973-74
(in thousands of \$*U.S.)

	IFY*	IFY
	1968-69	1972-73
<i>Metal Cutting Machine Tools</i>		
Single spindle horizontal lathes	330.5	170.1
Multi-spindle lathes	231.3	175.8
Capstan lathes	321.9	—
Turret lathes	184.2	60.4
Copy lathes	528.3	—
Other lathes	3,200.4	1,675.4
Boring machines	4,716.8	3,056.7
Broaching machines	544.0	333.8
Drilling machines	2,031.3	1,790.1
Other boring, broaching, drilling and threading machines	680.8	663.6
Milling machines	2,974.8	4,558.9
Gear cutting and finishing machines	1,057.2	841.3
Planing, shaping and slotting machines ..	283.7	254.9
Grinding machines	4,388.5	4,842.2
Lapping, polishing and honing machines ..	675.5	579.0
Sawing, filing and cutoff machines	216.4	693.3
Total	22,360.6	19,355.2
<i>Metal Forming Machine Tools</i>		
Bending and forming machines	145.8	204.4
Wire and metal drawing machines	177.0	139.0
Others	486.0	281.5
Hydraulic extrusion	96.1	46.6
Hydraulic presses, n.e.s.	4,221.2	596.5
Transfer and multiple presses	12.9	50.0
Horizontal presses	62.2	—
Other mechanical presses	1,553.5	1,314.6
Friction screw presses	105.8	156.0
Other manual presses	789.4	174.4
Punching machines, incl. turret	—	42.4
Rotary shear, including slitting	12.9	36.5
Punching, shearing machines, n.e.s.	179.0	99.0
Hammers, steam, air	78.4	36.8
Hammers, mechanical	192.0	16.6
Forging machines, n.e.s.	322.2	20.2
Riveting machines	59.3	13.3
Metal forming machinery, n.e.s.	2,703.8	545.7
Total	11,397.5	3,773.5
<i>Other Metalworking Machine Tools</i>		
Electro erosion	1.8	44.7
Ultrasonic cutting machines	14.5	1.1
Special multistation transfer machines	393.3	—
Unit head milling machines	—	12.2
Other	4,192.6	3,521.2
Total	4,602.2	3,567.0
<i>Other Metalworking Equipment and Parts</i>		
Parts and Accessories for Machine Tools		
Parts of machine tools for working metals	4,347.0	5,180.9
Other machine tool parts	127.2	386.9
Tool holders for tools	37.6	74.8
Chucks, mechanical or pneumatic	41.0	7.7
Work and tool holders	26.2	64.4
Jigs and fixtures	371.9	142.6
Other accessories	7,460.9	3,741.2
Total	12,410.9	9,598.5
Chasers	19.5	95.2
Dies	352.7	329.4

Lathe tools and toolbits, n.e.s.	7.4	2.0
Milling cutters	132.2	159.3
Press tools	85.4	83.7
Rock drilling or core drilling bits	226.9	4.8
Reamers	36.6	30.0
Taps	17.9	23.2
Tungsten carbide tipped tools	4.1	9.7
Interchangeable tools for machine tools, n.e.s.	1,201.2	582.8
Cutting blades for metalworking machine tools	979.8	57.2
Other cutting blades for machines	82.4	420.1
Tungsten carbide tips	13.2	2.3
Other tool tips, etc.	134.6	283.1
Total	3,593.9	2,082.8
Grand Total	53,521.4	49,608.7

* Indian Fiscal Year (IFY) runs April through March.

Source: Government of India Monthly Statistics of the Foreign Trade of India.

available for the importation of machine tools. German credits are untied and can theoretically be used for the purchase of American machine tools. However, for the immediate future, U.S. exporters will have to rely primarily on free foreign exchange purchases of privately arranged financing.

In the case of less sophisticated machine tools, the United States faces strong competition from East European countries. These sources have been successful in securing large Indian orders, primarily because of the competitive advantage they enjoy as a result of bilateral rupee-payment arrangements with India.

India has attained self-sufficiency in the area of general purpose machine tools such as drilling machines, lathes, milling machines, grinders, planers and shapers. Manufacture of heavy duty and sophisticated machines, including vertical and horizontal boring machines, multi-spindle automatics, gear hobbing machines, heavy duty copying lathes and transfer lines, is also off to a good start. Imports have consisted chiefly of heavy duty turret boring, milling and turning machines; jig boring machines; automatic nut tapping machines; thread and spline hobbing machines; thread grinding machines; bed type milling machines; gear shaver, gear grinder, and high precision toolroom type cylindrical grinders; internal grinders, centerless grinders; and a few numerically controlled machines.

Best Sales Opportunities

The U.S. Embassy in New Delhi identified the following categories of U.S. equipment as offering the most promising sales potential in India during the next 5 years, based on discussions with officials of the Tools Directorate, Directorate General of Technical Development, Ministry of Industrial Development, Planning Commission, and well-informed business contacts.

Table 3.—India: Imports of Metalworking Equipment from Selected Countries IFY 1972-73*

	(in millions of U.S. dollars)					
	Total	U.S.	Germany	Italy	Japan	U.K.
Metal cutting machine tools	19.36	1.07	3.66	.73	.13	3.26
Metal forming machine tools	3.77	.84	1.15	—	.08	.69
Other metalworking machine tools	3.57	.49	.58	.18	.27	.40
Other metalworking equipment	11.23	.19	1.47	.56	1.68	1.32
Parts & accessories for MT's	9.60	1.97	2.08	.13	.22	1.78
Tools & dies for MT's	2.08	.33	.46	.04	.09	.65
Total	49.61	4.89	9.40	1.64	2.47	8.10

* Indian Fiscal Year (IFY) runs April through March.

Source: Government of India, Monthly Statistics of the Foreign Trade of India.

Metal Cutting Machine Tools

- Jig boring machines
- Deep hole drilling machines
- Bevel gear cutting machines
- Geargrinding, honing and lapping machines
- Gear tooth chamfering and rounding machines
- Internal centerless grinding machines
- Internal, chucking, horizontal and vertical grinding machines
- Roll grinding machines
- Cam and camshaft grinding machines
- Copy grinding machines
- Crankshaft, jig, NC profile, and thread grinding machines
- Keyseating machines
- Honing machines—centerless, external and internal
- Lapping machines—centerless, cylindrical and surface
- Electrical discharge machining (EDM) equipment
- Electrochemical machining (ECM) equipment
- Electrolytic grinding machines (ELG)
- Ultrasonic cutting machines
- Thread grinding and rolling machines
- Axle turning, camshaft, crankshaft and railroad wheel lathes

Metal Forming Machine Tools

- Heavy duty cold and hot headers, and counter-blow hammers

Prospects for Numerical Control and Non-Conventional Machining Equipment

The Central Machine Tool Institute (CMTI) and the Hindustan Machine Tools Limited (HMT), Bangalore, have entered into a licensing arrangement with the American Tools, Inc., and Kearney, Trecker and Marwin (KTM) of England to develop a numerically controlled vertical machining center. A prototype being developed at the HMT factory will be equipped with KTM numerical controls. End-users and distributors of machine tools estimate demand at 50-75 NC machines in the next 5 years. Currently, 35 NC machines (13 large, 17 medium and 5 small) are in use in India. These are of Swiss, German, British and Dutch manufacture. "Agetron" and

"Charmillis" (Swiss) are reported to be popular brands.

With the proposed manufacture of supersonic jet fighters and other sophisticated defense equipment, demand for NC machine tools is expected to increase. Digital readouts for lathes and boring machines will also be required. Prospects for the purchase of numerical controls for retrofitting are regarded as limited.

As of 1974, only the Dutch subsidiary, Philips India Limited, Calcutta, had service facilities for NC machines. With the assistance of UNIDO, the CMTI proposes to establish a Numerical Control Center for the metalworking industry. The proposed UNIDO investment in this project is \$1.5 million. If implemented, the project will involve an expenditure of \$878,000 for imported equipment.

End-User Industries

Encouraged by the increasing efficiency of the major public engineering corporations, the Government of India has decided to raise its production targets for 1974 by about 34%. The Government also has decided in principle to remove constraints on diversification for private machinery manufacturers. The Fifth Five-Year Plan (1974-79) calls for greatly increased investment in the organized industry and mineral sector in order to reach a sectorial growth rate of 8.1%. In addition, the Ministry of Defense, whose development aims are not incorporated in the general government economic programs, plans to make huge investments in priority areas such as radar, missiles, aeronautics (including military aircraft), and naval services. The Ministry of Railways (Railway Board) has ambitious plans to modernize workshops. Its replacement and reconditioning requirements are placed at roughly \$180 million. The Board also plans to establish plants for traction motors and traction gears. Electronics, telecommunications, computers and mass communication equipment are expected to be primary growth areas in the next 5 years. All major public and private sector producers of commercial vehicles, scooters and motorcycles have been authorized by the government to submit proposals for substantial expansion of capacities. Existing manufacturers of industrial machinery also have plans to expand.

A few notable plant expansions and diversifications planned during the 1974-78 period, with projected investment levels, are: Bharat Heavy Electricals Limited, New Delhi (\$152 million); Hindustan Machine Tools Limited, Bangalore (\$60 million for diversification); Heavy Vehicle Factory, Jabalpur (\$130 million to increase annual capacity to produce an additional 45,000 trucks for civilian use); Bharat Heavy Plates & Vessels Limited, Visakhapatnam (\$12 million); Gharat Pumps & Compressors Limited, Naini, Allahabad (\$8 million); Heavy Engineering Corporation, Ranchi (\$40 million) and a proposed new heavy engineering project—site yet to be decided—(\$120 million).

Effective May 31, 1974, the Government is introducing a higher rate of "initial depreciation" of 20% for imported and locally purchased machinery and equipment. India provides additional financial incentives including low rates of interest, a subsidy of 50% of the transport cost of both new materials and finished products, and favorable treatment for imports of equipment, components and raw materials if a project is established in a "declared" backward industrial area.

The 10 industrial sectors identified as the principal prospective purchasers of metalworking and finishing equipment during the 1974-78 period are:

- Military aircraft, engines, parts and accessories
- Missiles and radars
- Motor vehicles and parts
- Bearings
- Telecommunications and electronic equipment
- Construction, mining and material handling equipment
- Engines and turbines
- Shipbuilding and repair
- Railroad equipment
- Iron and steel forging and castings

Major Indian prospective buyers for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, Metalworking and Finishing Equipment-India, available for \$3 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest District Office. In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Domestic Manufacture of Metalworking and Finishing Equipment

The Indian MFE industry consists of over 160 manufacturing units in the "organized" sector, which excludes cottage industry establishments. Domestic production of MFE increased from about \$7.5 million

in 1953 to an estimated \$126 million in 1973. A dozen of the larger public and private units account for about 80% of the total value of production. Five public sector firms which account for about 50% of the current total production of \$126 million of MFE are: Hindustan Machine Tools Limited (HMT), Bangalore; Praga Machine Tools Corporation, Secunderabad; Machine Tools Prototype Factory, Ambarnath; Heavy Machine Tools Corporation, Ranchi; and Machine Tools Corporation of India Limited, Ajmer. HMT is the largest producer. Mysore Kirloskar, TELCO, Cooper Engineering, New Standard and Ex-Cell-O are the principal private sector metalworking equipment manufacturers.

Most of the important companies manufacturing MFE in India rely heavily on imported technology. For example, 26 of HMT's 40 metalworking designs were developed with the assistance of foreign companies. In all, 68 foreign companies currently have active collaborative arrangements in India.

MFE produced by Indian affiliates of foreign companies accounts for roughly 60% of the present total production.

The Fifth Five-Year Plan forecasts a doubling of local production of MFE to \$304 million by 1978. To accomplish these plan targets, the Government of India has projected a capital investment of \$67 million for the production of machine tools, parts and accessories both in the public and private sectors. The Government also is encouraging entrepreneurs to enter this field. The State-owned Hindustan Machine Tools Limited (HMT) and the Machine Tool Corporation of India Limited (as of April 1, 1974, MTC became a division of HMT) have been authorized to spend \$22 million and \$3 million, respectively, during the next 5 years for developing new lines of production within the category and to expand existing capacities. Some 25 important private companies have definite programs to expand and develop new machine tools and accessories. During 1972 and 1973, the Indian Government approved six new joint venture agreements with foreign machine tool manufacturers, including two from the United States.

India's 1974 production of cutting tools, grinding wheels, diamond tools and bits, precision measuring instruments, jigs, fixtures and press tools is valued at \$58 million. The existing manufacturers, and a few new companies, plan to invest \$40 million through 1978 to meet increasing demand. In this area, six Indian companies recently entered into licensing arrangements with foreign firms.

Three companies are manufacturing metal finishing equipment at present. Their combined production is roughly \$3 million. The largest producer is an affiliate of an American company. Another company has been licensed to manufacture shot blasting equipment in collaboration with a British company. These 4 companies will produce \$5 million worth of equipment by 1978.

Trade Regulations and Practices

All imports are subject to licensing, and the Government of India follows very strict import control regulations. Current Indian policy does not permit importation of MFE by wholesale distributors for stock and resale purposes. Licenses are issued only to end-users, and agents therefore play a key role in handling foreign sales. There are about 24 MFE sales agency establishments which are able and willing to sell new lines of equipment not now on the market.

Tariff rates are predominantly ad valorem. The current rate of import duty on machine tools is 40% plus 2.5% regulatory duty. While the tariffs are established both for protection of domestic manufacturers and to raise revenues, they are not regarded as a deterrent to imports of U.S. equipment.

Technical Requirements

India subscribes to the standards issued by the International Standards Organization. Domestic standards are established by the Indian Standards In-

stitution (ISI). The German Schlesinger system has been adopted for grading of machine tools. The metric system of weights and measures is used.

Electrical power in India is 230/200 volts, 1 and 3-phase, 2 and 4-wire, primarily 50 Herz AC. Indian users insist on tropical insulation of all electrical equipment.

Standard marking practices are followed for cargos destined for India; however, to prevent pilferage it is recommended that markings be in large letters directly on crates rather than on tags, and that trade names which reveal the nature of the contents not appear on the outside of the packing. Each piece of equipment must be clearly marked "Made in U.S.A."

The market research study on which this Country Market Brief is based is "The Market for Metalworking and Finishing Equipment in India," DIB 74-11-507. It is available from the U.S. Department of Commerce, Domestic and International Business Administration, Office of International Marketing, Washington, D.C. 20230.

Iran

Huge oil revenues have boosted Iran's gross national product (GNP) by 20%¹ a year since 1970. Income from oil, which was about \$1 billion² in 1970, reached \$4 billion in 1973 and the 1974 level is an estimated \$18 billion. This spectacular climb is expected to continue through the next several years, pushing GNP to over \$40 billion in 1976 and providing Iran's economy with a large and reliable source of development capital. The industrial sector has been one of the major beneficiaries of the funds available from the exploitation of petroleum resources. Investment in industry sent the country's industrial production index up 86 points from 1970 through 1974, and it is projected to rise at least 30 points a year through 1976.

The market for metalworking and finishing equipment (MFE) in Iran is expected to increase over 30% annually through 1978. It will be supported substantially during Iran's Fifth Five Year Development Plan (March 21, 1973-March 20, 1978) by Iranian Government investment in the country's metalworking industries of at least \$14 billion and by an expected investment of \$12 billion over the same period by the private sector. Furthermore, a revision of the Five Year Plan allocations, which is taking into account the rapid rise in oil revenues, probably will greatly increase the projected government investment.

Construction of new facilities, rather than expansion of existing plants, is expected to absorb most of the planned investment in the metalworking industry. The machine tools currently installed in Iran were purchased relatively recently—30% are less than 5 years old and 60 to 65% are less than 10 years old—so the replacement market will be very small at least through 1978.

Domestic manufacture of metalworking and finish-

ing equipment is very limited in Iran. Local demand, therefore, is met almost entirely by imports (see table 1). East European countries and the People's Republic of China are the traditional suppliers of inexpensive, simple pieces of equipment. Germany, with 28% of the market, the United Kingdom with a 10% share, Italy, with 8%, and the United States are the largest Western suppliers of metalworking equipment to Iran (see table 2). The technological level of U.S.-made machinery had been considered to be too high for the needs of the average end-user in Iran. U.S. producers, however, can anticipate an increase in their current share of 6% of the market as Iranian manufacturers become more familiar with and attuned to the advantages of American advanced technology.

The Iranian metalworking industry is characterized by extremes in size, capital availability, and sophistication. Most manufacturers are small shops, usually located in or near the local bazaar, with very

Table 1.—Iran: Imports of metalworking equipment, FY 1971 and FY 1973
(in thousands of U.S. dollars)

Equipment	1971 ¹	1973 ¹
Milling machines	253	376
Lathes	4,637	4,188
Grinding and polishing machines	395	619
Cutting machines	700	375
Drilling machines	1,049	289
Other nonpneumatic machines and parts	12,305	12,479
Pneumatic machine tools	707	60
Pneumatic tools	456	132
Parts for pneumatic machine tools	793	2,503
Hydraulic presses	510	111
Parts for hydraulic presses	75	393
Presses, n.e.s.	2,128	2,239
Parts for presses, n.e.s.	767	1,624
Total, metalworking equipment	24,775	25,388

¹ Years end March 20.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Iranian official trade statistics.

¹ In order to present a more accurate picture, growth rates have been calculated from local currency values. This eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation.

² The following exchange rates have been used to convert Iranian rials into U.S. dollars: 1970-72, 75.75; 1973-74, 76.50.

little capital. These shops usually have only small lathes or presses which they have purchased from Eastern Europe.

A smaller but quickly growing segment of the Iranian metalworking industry consists of modern factories, sometimes employing more than 1,000 workers, which are owned by both the public and private sectors. The largest end-users of MFE manufacture motor vehicles and parts, household appliances, and building materials and construction machinery. New projects planned in the next 5 years, which are expected to provide additional sales opportunities for U.S. suppliers, include: factories for the production of motor vehicles; agricultural machinery and equipment, and electrical industrial apparatus; shipbuilding and repair facilities; and railroad equipment repair facilities.

In addition to its direct investment in individual enterprises, the Government of Iran has allocated over \$200 million for loans to assist private investors in the metalworking industries during the 1973-78 period. The government also protects infant industries by assessing high customs tariffs on imports which compete with products manufactured by the newly established enterprises.

Two government-owned facilities, located in Tabriz and Arak, assemble simple machine tools under license from East European firms (primarily Skoda of Czechoslovakia). They are the only manufacturers of metalworking or finishing equipment in Iran. Their output includes drills, lathes, and presses. Both plants are underutilized—the Tabriz plant operates at approximately 20% of its 10,000-ton capacity—and their managers are seeking additional licenses to assemble other types of metalworking equipment.

Major end-user firms and prospective customers in Iran for metalworking and finishing equipment are listed in the U.S. Department of Commerce publica-

tion, Target Market Trade List, Metalworking and Finishing Equipment—Iran, available for \$3 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230 or through your nearest District Office. In addition to listing major prospective customers the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Sales Opportunities

The following items have been identified by the commercial section of the U.S. Embassy in Tehran as having the best potential for sale in the Iranian market:

- Lathes
 - Engines
 - Semiautomatic
- Punch, shear, notch, and copying machines
- Horizontal boring-drilling-milling machines
- Bed-type milling machines
- Free abrasive grinding machines
- Deburring machines
- Presses
 - Forging
 - Adjustable bed
 - Pneumatic
- Forging hammers
- Bar, tube, shapes, and pipe benders
- Metal parts hardening and painting equipment

Trade Regulations and Practices

The tariffs assessed on most metalworking and finishing equipment imported into Iran range from 10 to 15% of the cost, insurance, and freight (c.i.f.) value. A Commercial Benefits Tax (CBT), ranging from 5 to 15%, also is levied on the c.i.f. value. Iran has no preferential import system. Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Office of

Table 2.—Iran: Imports of metalworking equipment from selected countries, FY 1973¹

(in thousands of U.S. dollars)

Equipment	Total Imports	United States	West Germany	United Kingdom	Japan	Italy
Milling Machines	376	—	57	27	1	6
Lathes	4,188	14	963	377	14	59
Grinding and polishing machines	619	2	254	6	—	226
Cutting machines	375	11	214	34	—	28
Drilling machines	289	—	44	—	—	146
Other nonpneumatic machines and parts	12,479	619	3,888	1,630	123	1,131
Pneumatic machine tools	60	8	31	1	—	—
Pneumatic tools	132	4	6	33	1	*
Parts for pneumatic machine tools	2,503	69	111	159	5	39
Hydraulic presses	111	2	31	3	3	8
Parts for hydraulic presses	393	5	266	5	8	2
Presses, n.e.s.	2,239	573	439	264	83	438
Parts for presses, n.e.s.	1,624	197	831	52	2	22
Total, metalworking equipment	25,388	1,504	7,117	2,591	240	2,105

¹ Year ends March 20, 1973.

* Less than \$500.

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Iranian official trade statistics.

International Marketing, Washington, D.C. 20230. Imports of metalworking and finishing equipment require an import license.

All Western suppliers of metalworking and finishing equipment have appointed sales agents and distributors in Tehran, although they sell most of their advanced equipment directly to new factories, either as part of a turnkey project or through tenders supervised by consultants. Very few Iranian agents or end-users have sufficient technical background to purchase sophisticated equipment. However, many are interested in programs which would familiarize them with technologically advanced machinery and would train workers to operate it.

Technical Requirements

There have been no standards set for the purchase and operation of metalworking and finishing equipment in Iran. There also are no marking or labeling requirements.

The electrical power supply is 220/380 volts, 50 cycles. Iran uses the metric system of weights and measures.

The market research study, on which this Country Market Brief is based, is "The Market for Metalworking and Finishing Equipment in Iran," DIB 74-10-514.

The Philippines

The Philippine government has undertaken four major industrial programs aimed at developing the country's automobile, truck, maritime, and agricultural machinery industries. As a result, the market for metalworking equipment¹ is growing. Imports of such equipment should increase to about \$17 million in 1978. This represents a 12% average annual growth rate over the \$8.6 million recorded in 1972.

Although domestic output is expected to increase commensurate with demand, imports will continue to supply the overwhelming bulk of metalworking equipment needs. Domestic production of metalworking equipment is limited to the fabrication of light machinery by only a few firms, foremost of which is the Machine Tools Manufacturing Co., Inc., a producer of lathes.

Japan and the United States were the largest suppliers to the Philippine market in 1972, supplying 30.1% and 25.5% respectively (see table 1). Other suppliers included Taiwan, with a 9.1% share, the United Kingdom (7.8%), and Germany (6.2%).

The United States supplied over 80% of the Philippines market for metal forming equipment in 1972, while Japan accounted for 45% of the import market for metal cutting machine tools. Imports of tools, dies, and parts and accessories for machine tools amounted to approximately \$3 million in 1972; the United

States furnished 47% while Japan, the second largest supplier, accounted for 22%.

Japan's aggressive sales efforts, its proximity to the market, and its introduction of equipment through a reparation program have been the major factors in its success in the Philippines market. However, because of the termination of the reparations program in 1975 and the effects of steeply rising prices for its equipment, Japan's share in the market is likely to fall during the 1975-78 period. The next five years should witness a growth in the market share for U.S. products, partially as a result of the expected drop in Japan's market share but, more importantly, because of the increasing reputation of American products in the Philippines for durability and efficiency.

Metalworking equipment from Taiwan is gradually gaining acceptance in the Philippines market. Although the quality is below par by international standards—the normal life expectancy is under 5 years—the cost of such machinery is relatively low, making it affordable to small end-users. Taiwan exports consist mainly of small machine tools.

Sales Opportunities

The following items have been identified by the commercial section of the U.S. Embassy in Manila as having the best sales potential in the Philippines market:

- Pipe threading machines
- Hydraulic presses
- Gear cutting and finishing machines

¹ Due to a lack of official trade statistics and other reliable information on metal finishing equipment, discussion in this survey is limited to metalworking equipment.

Table 1.—The Philippines: Imports of metalworking equipment from selected countries, 1972
(in thousands of U.S. dollars)

Type of Equipment	Total Imports	U.S.	Japan	Germany	Taiwan	U.K.	Other
Metal cutting machine tools	3,207	129	1,445	158	376	363	736
Metal forming machine tools	241	194	15	—	13	8	11
Other metalworking equipment	2,126	467	509	218	313	184	435
Parts & accessories for machine tools	1,275	632	376	81	23	15	148
Tools and dies for machine tools	1,721	763	276	77	53	100	452
Total	8,570	2,185	2,621	534	778	670	1,782

Source: U.S. Department of Commerce, Bureau of International Commerce market research study.

- Bed type milling machines, single spindle
- Milling machines, multi-spindle and special purpose
- External, centerless grinding machines
- Crankshaft grinding machines
- Valve grinding machines
- Bench grinding machines
- Cylinder boring machines
- Horizontal boring-drilling-milling machines
- Jig boring machines
- Vertical boring machines, traveling column
- Center column drilling machines
- Bending and forming machines
- Turret lathes
- Guillotine shears, mechanical
- Nibbling machines
- Notching machines

End-User Industries

There are 300 to 400 manufacturers in the Philippines which use metalworking equipment. The automotive industry, comprising approximately 40 firms, is the largest end-user of such equipment. Sales of the industry in 1969 exceeded \$95 million and capital expenditures approximated \$4 million. Automobile production is anticipated to reach 20,000 vehicles annually as a result of the government's Progressive Car Manufacturing Program. The horizontal integration implied in the program will mean the initiation of auto parts production and a certain increase in expenditures for capital goods. In addition, the Philippine Board of Investments has announced plans for the Progressive Truck Manufacturing Program, which is expected to spur the manufacture of light vehicles (jeeps, pickups and vans).

The shipbuilding industry is composed of some 12 firms. While capital investment is low, trade sources envision a substantial increase in capital expenditures once the maritime development program is fully implemented. The program involves the modernization and expansion of the country's merchant fleet, including the construction of 56 ships from 1,500 to 4,500 dead weight tons. Capital investment for the project is estimated at \$84 million. With the intensification of ship repair activities as well as ship production, there appears to be a promising market for metalworking equipment.

The government's proposed farm mechanization program should contribute toward the growth of the agricultural machinery industry. The program calls for the development and manufacture of machinery designed to support the country's efforts to expand agriculture production.

In addition to the above plans, all of which are expected to increase demand for machine tools, a major production facility is being planned for the domestic manufacture of compressors for use with appliances.

Major end-user firms and prospective customers in the Philippines for metalworking and finishing equip-

ment are listed in the U.S. Department of Commerce publication, Target Market Trade List, Metalworking and Finishing Equipment—The Philippines, available for \$3 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest District Office. In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

Trade Regulations and Practices

All metalworking equipment imported into the Philippines is subject to an import duty of 10% based on 110% of the f.o.b. price. In addition, imports are subject to an Advance Sales Tax, representing 7% of the duty-paid value if purchased directly by the end-user and 7% of 125% of duty-paid value when imported by an agent or distributor.

For the most part, metalworking equipment is imported by agents and distributors. However, a number of large manufacturers prefer to import directly from foreign suppliers.

Sales are made either on a cash or open account basis. Agents terms of payments vary and are flexible, depending upon the customer, but normally extend for a minimum of 12 months to a maximum of 2 years.

Technical Requirements

The Philippine Government agency responsible for the issuance and implementation of rules and regulations regarding the standardization of locally produced products is the Technical Division of the Bureau of Standards, 6th Floor, Manufacturers Bank Building, Plaza Sta. Cruz, Manila.

For the most part, Philippine manufacturers use AME standards.

Power supply in the Philippines is normally 220 volts and 60 cycles, but 110 volts 60 cycles is also available. Large manufacturing plants with power requirements greater than 220 volts usually have their own sub-stations. Philippine utilities operate at 60 cycles.

The principal system of weights and measures used in the Philippines is the metric system, although the English system is also followed. However, Presidential Decree No. 187 of May 10, 1973 establishes the metric system as the standard of measurement for all products, commodities, materials, utilities and services and in business and legal transactions. The decree sets 1975 as the date by which the transition must be accomplished.

The market research study on which this Country Market Brief is based is "The Market for Metalworking and Finishing Equipment in the Philippines," DIB 74-11-506. It is available from the U.S. Department of Commerce, Domestic and International Business Administration, Office of International Marketing, Washington, D.C. 20230.

Portugal

Beginning from a small base in 1973, the market for metalworking and finishing equipment in Portugal will expand rapidly during the next 5 years. Plans call for the initiation of a number of major infrastructure projects, including the new Lisbon airport, the Lisbon-Oporto toll highway system, the new deep-water port at Sines, the Sines refinery, petrochemical complex and automobile factory, and other public and semipublic endeavors. The implementation of the large-scale projects will cause a significant increase in demand for the fabrication of metal structures which, in turn, will create new markets for metalworking and finishing equipment (MFE). The new government which took power in April 1974 has firmly emphasized its commitment to the completion of these projects.

Table 1.—Portugal: Imports of machine tools, 1970, 1971
(in U.S. dollars)

Type of Equipment	1970	1971
<i>Machine tools weighing up to 1,000 kilograms each</i>		
Engine lathes	123,991	129,570
Shaping machines	35,150	14,892
Saw-sharpening machines	28,969	66,051
Horizontal and vertical drilling machines	61,931	130,772
Other boring and drilling machines	77,253	85,321
Hobbing machines	7,510	—
Other machines	160,042	130,429
total	494,846	557,035
<i>Machine tools weighing more than 1,000 kilograms but not more than 2,000 kg. each</i>		
Engine lathes	140,042	219,613
Shaping machines	11,802	15,751
Horizontal and vertical drilling machines	11,630	12,060
Other boring and drilling machines	6,266	34,463
Other machines	50,557	40,472
total	220,297	322,359

<i>Fly-presses weighing up to 1,000 kg each</i>	total	2,145	13,244
<i>Hydraulic presses weighing up to 2,000 kg each</i>	total	33,690	39,742
<i>Hydraulic presses weighing more than 2,000 kg but not more than 5,000 kg each</i>	total	106,480	21,244
<i>Mechanical presses and power-hammers weighing up to 1,000 kg each</i>	total	29,442	30,815
<i>Riveting machines and flanging machines</i>	total	154,892	119,270
<i>Other machine-tools</i>			
Shaping machines	53,776	42,489	
Planing machines	—	99,098	
Saw-sharpening machines	15,708	33,948	
Presses	293,175	539,527	
Boring machines	471,201	951,201	
Milling machines	707,296	1,110,600	
Grinding machines with micrometric controls	700,515	620,515	
Parallel machine lathes	395,407	505,107	
Turret lathes, automatic	167,424	326,266	
Other turret lathes	19,227	41,373	
Other lathes, automatic	407,811	398,841	
Other lathes	91,416	408,798	
Horizontal and vertical drilling machines	—	8,669	
Radial drilling machines	9,356	63,090	
Other drilling machines	66,137	140,214	
Gear cutting machines	1,716	18,712	
Boring machines	20,343	35,278	
Punching and shearing machines	194,592	231,201	
Metal bending and forming machines	318,798	299,613	
Other machines	4,466,223	7,976,266	
total	8,400,121	13,850,806	
<i>Machine tools for working metals and metallic carbides</i>			
total	9,441,913	14,954,876	

Source: Government of Portugal official trade statistics.

No official statistics exist for the consumption of MFE in Portugal. However, trade sources set consumption in 1972 at approximately \$20 million and estimate that imports in that year reached \$18 million, satisfying nearly 90% of demand; 1971 imports totaled nearly \$15 million (see table 1). Available statistics indicate that 1970 production of MFE in Portugal was valued at \$2.8 million, of which nearly \$900,000 was for lathes. Exports in 1972 were probably in the range of \$2.5 million, but a significant portion of these exports were semifinished goods assembled from imported components. German firms

Table 2.—Portugal: Imports of machine tools from major supplying countries, 1970, 1971

	1970	1971
West Germany	1,867.5	2,946.8
United Kingdom	1,039.7	1,768.5
Italy	909.6	1,538.0
Czechoslovakia	688.9	—
Spain	604.8	881.5
United States	172.3	319.0
Others	4,159.1	7,501.0
Total	9,441.9	14,954.8

Source: Official Portuguese trade statistics.

have been particularly active in this field. It is further likely that a part of this exported MFE is eventually re-imported into Portugal as components of larger pieces of equipment.

Demand for MFE in Portugal can be expected to growth at a rate of about 20% per year through 1978. This means that consumption should double between 1972 and 1976. Though local production will respond to some of this demand, well over 50% of this increase will be satisfied by imports.

Germany can be expected to maintain its strong lead among foreign suppliers of MFE (see table 2). In addition, Germany is the major source of investment capital in this sector, and German manufacturers believe they will benefit from the German industry's increased presence in the market. The Germans anticipate that new demand for their products resulting from German-owned installations in Portugal will more than offset export sales lost through import substitution.

While U.S.-made equipment is recognized in Portugal for its high quality, reliability and durability; pricing is a key factor in making U.S. equipment competitive in the Portuguese market. Buyers are inclined to opt for lower cost general purpose machine tools from European suppliers unless they feel that high tolerance requirements or the new technology incorporated justify the higher costs which they associate with U.S. equipment.

The U.S. Embassy in Lisbon has identified the following MFE categories as representing the best

sales potential of U.S. exporters during the period 1974-78:

- Milling machines
- Grinding machines with automatic gauging systems
- Boring machines
- Engine and toolroom lathes
- Automatic turret lathes
- Presses
- Punching and shearing machines
- Bending and forming machines

End-User Industries

Portugal has one of the smallest and least-developed industrial bases in Europe. However, the Portuguese Government is making a major public investment effort to stimulate industrial growth.

No statistics are available on capital investment in the MFE industry in Portugal. There are about six major machine tool builders, who produce primarily metal cutting machine tools, including lathes, milling machines, drilling machines and saws. However, trade sources estimate that possibly half of all new capital in this sector is being imported by foreign firms, with German industry out in front of all others.

Major end-user firms and prospective customers in Portugal for metalworking and finishing equipment are listed in the U.S. Department of Commerce publication, Target Market Trade List, Metalworking and Finishing Equipment—Portugal, available for \$3 from the U.S. Department of Commerce, Bureau of International Commerce, Export Information Division, Washington, D.C. 20230, or through your nearest District Office. In addition to listing major prospective customers, the Trade List identifies principal potential agents and distributors, relevant local trade publications, and trade associations.

The Portuguese Government offers an attractive system of fiscal incentives for industries which incorporate new technology and offer export and import substitution potential. The government permits foreign investment in the MFE sector on a selective basis and has been especially receptive to firms planning to utilize new technology. American investors are not active in this sector. Continued heavy German investment in MFE manufacturing seems likely as long as wage rates in Germany rise faster than wages in Portugal and the German mark continues to hold a strong position vis-a-vis the Portuguese escudo.

Since imports are the major source for MFE in Portugal, new-to-market manufacturers will often find it difficult to find a local representative who does not carry one or more competing lines of equipment.

The study on which this Country Market Brief is based is "The Market for Metalworking and Finishing Equipment in Portugal," DIB 74-11-508.

Switzerland

Switzerland's industrial sector contributes just under 50% of the country's gross national product. Industrial production grew rapidly during the 1968-73 period, largely in response to export demand, and boosted the economy at an average rate of 12% per year.¹ Capital investment also grew at a fast pace—approximately 14% annually—and reached \$12.4 billion in 1973. However a manpower shortage and, to some extent, credit restrictions are severely limiting the further expansion of industrial capacity. Future growth in output therefore will depend on increasing the productivity of existing facilities.

The end-users of metalworking and finishing equipment (MFE) may be expected to replace their older machinery with more automated, versatile, and multifunctional equipment in order to increase their output despite the restrictions on expanding industrial plans. The Swiss annual market for metalworking machinery is approaching \$120 million (see table 1). It rose from \$92 million in 1972 to an estimated \$118 million in 1974 and should grow at a modest rate of 4% a year through 1978.

Consumption of metal cutting machine tools grew at an average annual rate of 12% from 1968, reaching \$61 million in 1972, and rose further to over \$80 million in 1974.

Imports supply about 60% of the domestic market. Statistics on the market for metal forming machine tools were not available before 1972. The market in that year was \$12.6 million, 75% (or \$9.5 million) of which was supplied by imports. Purchases rose to an estimated \$15 million in 1974. Demand for other metalworking equipment, including machine tool parts and accessories, showed spectacular growth between 1968 and 1972. It climbed at an annual rate of 37% to reach \$18.9 million. The 1974 market was an estimated \$22 million.

There is also a steadily expanding market for

Table 1.—Switzerland: Consumption of metalworking equipment, 1968, 1972, and 1974
(in millions of U.S. dollars)

	Metal cutting machine tools (MT)	Metal forming machine tools	Other metalworking equipment, MT parts and accessories	Total
1968				
Production ..	112.2	n.a.	25.2	137.4
Imports	19.3	n.a.	11.0	30.3
Exports	97.6	n.a.	31.5	129.1
Consumption	33.9	n.a.	4.7	38.6
1972				
Production ..	173.2	23.8	44.5	241.5
Imports	38.1	9.5	13.5	61.1
Exports	150.6	20.7	39.1	210.4
Consumption	60.7	12.6	18.9	92.2
1974				
Production ..	—	—	—	—
Imports	—	—	—	—
Exports	—	—	—	—
Consumption	80.7	15.5	22.3	118.5

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Swiss trade source estimates.

metal finishing equipment in Switzerland but statistics on it are not available. The discussion in this report, therefore, will be concerned primarily with metalworking machinery.

Swiss metalworking machinery producers have been operating at full capacity for years and their backlog of orders is slowly rising; it was 8.5 months at the end of 1974. Furthermore, Swiss MFE manufacturers customarily export 80 to 90% of their production, and this is not likely to change in the near future unless conditions deteriorate considerably in their major overseas markets. Imports, therefore, should continue to account for at least two-thirds of Switzerland's total annual purchases of metalworking machinery (see table 2).

The United States is in fifth place in the Swiss machine tool import market ranking behind Germany, Italy, the United Kingdom, and France. The

¹ In order to present a more accurate picture, growth rates have been calculated from local currency values. This eliminates the effect of changes in currency alignments, though the rates still reflect the effect of domestic and imported inflation

Table 2.—Switzerland: Imports of metalworking equipment, 1968 and 1972
(in thousands of U.S. dollars)

Equipment	1968	1972
Metal cutting machine tools		
Lathes	5,657	11,128
milling and planing machines	6,632	10,944
grinding & sharpening machines	4,452	7,558
drilling machines	2,516	6,413
plate shears	n.a.	2,114
total	19,257	38,157
Metal forming machine tools		
presses	n.a.	9,468
total	n.a.	9,468
Other metalworking machine tools,		
machine tool parts and accessories	11,051	13,507
Total metalworking equipment	30,308	61,132

Source: U.S. Department of Commerce, Bureau of International Commerce market research study. Values based on Swiss trade source estimates.

U.S. share of imports in 1972 was \$2.5 million, or 3.2%. However, if equipment sold in the Swiss market by U.S. subsidiaries in Europe is added to that imported directly from the United States, the U.S. share is about 13% and second only to Germany. Swiss purchases of German metalworking machinery in 1972 amounted to \$46 million, representing almost 60% of total purchases from abroad. Italy held 11% of the import market, the United Kingdom, 9%, and France, 7%.

Swiss buyers generally consider U.S. equipment to be technologically superior to that produced by other manufacturers and often are willing to pay up to 15% more for American-made machinery. Furthermore, the prices on certain types of U.S. machines, i.e., numerically controlled machine centers and other specialized equipment, now are lower in prices than those produced by Swiss and German manufacturers. Thus, despite lower transportation costs and conditions which are more conducive to uninterrupted deliveries and after-sales service from their chief competitors, U.S. suppliers are expected to expand their sales to Switzerland by 3 to 4% annually in the next 5 years. Since total machine tool imports are not likely to grow significantly, the U.S. share probably will increase at the expense of German and, to a smaller degree, British suppliers.

Sales Opportunities

The following items have been identified by the commercial section of the U.S. Embassy in Bern as having the best potential for sale in the Swiss market:

- Numerically controlled machines, particularly those suitable for short-to-medium production runs, including:
 - boring machines
 - drilling machines
 - engine lathes
 - horizontal and vertical turret lathes
 - machining centers
 - grinding machines
 - milling machines
- Automatic turning machines
 - single spindle bar and chucking machines

- multispindle horizontal bar and chucking machines
- Horizontal boring-milling-drilling machines
- Turret head drilling machines
- Gear cutting and finishing machines
- Cylindrical grinding machines
- Jig grinding machines
- Milling machines
 - horizontal and vertical bed type
 - copy milling machines
 - openside and double column planer milling machines
- Sawing machines
- EDM and ECM
- Tools and accessories for machine tools
 - boring, carbide, facing tools
 - grinding belts and wheels
 - milling cutters
 - punches
 - single point and cut-off tools
 - tool presetting equipment
 - boring bars
 - indexing and rotary tables
 - tapping attachments

End-User Industries

There are an estimated 3,500 to 4,000 factories in Switzerland which use metalworking and finishing equipment. Watch and clock manufacturers constitute the largest single end-user industry in terms of estimated capital expenditure. They employ 65,000 workers in 600 plants. Other major end-users manufacture textile machinery, electric motors, electronic instruments, components, power and communications equipment, machine tools, pumps and compressors, and materials handling equipment.

The government's interference, either benevolent or restrictive, in Swiss industry is minimal. Industry traditionally has generated over 80% of the funds necessary for research and development and for plant expansion from its own earnings. Taxes on corporate profits are low, however, and substantial depreciation allowances granted by both the federal and cantonal governments help to stimulate capital investment in machinery.

Congested factory sites and Switzerland's perennial labor shortage have left little room for the construction of additional plants at home. Many manufacturers have been relocating production and research facilities to other countries in Eastern Europe and overseas. In fact, the foreign subsidiaries of some of Switzerland's largest companies are providing the greater part of their sales and profits. The domestic firms must rely on increasing the productivity of their equipment in order to raise output. Over the next several years, they are expected to purchase more efficient and fully automated metalworking and finishing equipment which can be operated primarily by unskilled workers.

Domestic Manufacture of Metalworking and Finishing Equipment

Between 80 and 90% of Swiss output is exported, and approximately 9% of all machine tools sold in the world today are of Swiss origin.

The Swiss metalworking and finishing equipment industry comprises 179 small-to-medium size and six large companies, and it employs a total of 19,400 persons. The equipment produced is tailored to the requirements of a wide range of industries, from watchmaking to the manufacture of heavy power equipment. Though they presently produce all types of machine tools, from the simplest and most conventional to the most advanced and sophisticated, Swiss companies are becoming increasingly specialized and are concentrating on the production of high-cost, custom-built machines.

The Swiss have been particularly successful in marketing their fully automatic lathes ("Swiss type automatics"), two- and three-dimensional copying controls for machines which perform automatic turning and milling operations in conjunction with automatic loading and linking cycles, and numerically controlled machine tools. Their newest types of machines include: program-controlled automatic lathes equipped with eight-station turret heads whose turret and copying slide have been combined into a single turret copying unit; two-spindle precision chucking automatic for materials of very poor machining characteristics; versatile automatic lathes with a comprehensive range of accessories which may be operated economically both for small batches of 200 units and large runs of up to 100,000 units for finish-machining of turned parts and for turning metal or plastic stampings, castings, die-castings, or injection moldings; production drilling machines with table for coordinate positioning; transfer machines without cams; and cylindrical grinding machines in three universality levels.

The following are the leading Swiss manufacturers of metalworking and finishing equipment: Andre Bechler Ltd. (automatic lathes and accessories and tools for automatic lathes); Dixi Ltd. (horizontal optical jig borers and tools and accessories for boring machines); Henri Hauser Ltd. (boring, grinding, and milling machines, metal finishing machines); Maag Gear-Wheel Co., Ltd. (gear cutting, and testing machines); Oerlikon-Bührle Machine Tool Works Ltd. (boring, drilling, and milling machines, lathes); Reishauer Ltd. (grinding and milling machines and tools, accessories, and auxiliary equipment for grinding and milling machines); Fabrique de Machines Schaublin S.A. (lathes and milling machines); SIP—Societe Genevoise d'Instruments de Physique (jig boring machines, milling machines, EDM with impulse generator); Machine Tool Works Fritz Studer Ltd. (grinding machines, sine centers); Usines Tornos S.A. (automatic cam milling machines, cam micrometers, milling attachments, slotting and back drilling attachments); Voumark Machines Co., S.A. (grinding machines and attachments).

Only two Swiss companies participate in joint ventures with foreign firms. They are Tarex-Manurhin S.A., Geneva, which manufactures programmed

hydrocopying turret lathes and automatic finishing and second operation lathes with sliding head in association with Brown & Sharpe; and Feintool AG, in Lyss, which has joint venture agreements with two German companies—SMG and Lorenz. Feintool also has a licensing agreement with Gem City Engineering Co.

Few foreign machine tools manufacturers have established subsidiaries in Switzerland. The manpower shortage and comparatively small domestic market may act as deterrents to foreign participation in the production of machine tools. Foreign suppliers also have found it more profitable to export their products to Switzerland rather than manufacture them there due to a marked absence of tariff and nontariff barriers to trade with Switzerland. A German firm, Traub of Reichenbach, is the only foreign manufacturer who has established a subsidiary production plant in the country. It produces automatic lathes. Brown & Sharpe has a sales subsidiary and owns a production facility, Tesa S.A. of Renens, which it purchased from a Swiss company. Tesa manufactures measuring instruments, controls, and other accessories to machine tools.

Trade Regulations and Practices

Switzerland imposes very low customs tariffs on imports of metalworking and finishing machinery and equipment. The rate of duty is assessed on the gross weight rather than on the value of the consignment. If calculated on an ad valorem basis, the duties on imports from the United States range from about 0.1% for the heaviest pieces to approximately 1.4% on the smaller machines. A sales turnover tax of 4.4% of the c.i.f. value plus customs duty, and a statistical fee of 3% of the dutiable value are assessed on all goods entering Switzerland.

Information concerning official duty rates applicable to specific products within the product category may be obtained from the U.S. Department of Commerce, Domestic and International Business Administration, Office of International Marketing, Main Commerce Building, Washington, D.C. 20230.

There are no quotas or licensing requirements imposed on imports and Switzerland has no currency restrictions.

There are approximately 160 importers and distributors of machine tools in Switzerland, in addition to the 185 local manufacturers who generally sell their products through their own sales organizations. The majority of the distributors are members of the Swiss Machine Tool Dealers Association. Only three foreign manufacturers have direct sales organizations in Switzerland; Brown & Sharpe, Cincinnati Milacron, and the German firm, F. Deckel. *Metalbearbeitung*, published by Edition F. Brun, Am Schanzengraben 11, 8000 Zurich, contains a comprehensive listing of metalworking machinery distributors.

Technical Requirements

Switzerland adheres to and strictly enforces the standards used throughout Western Europe for the electrical equipment and electrical parts of machine tools. The standards have been compiled in a booklet entitled *Electrische Ausrüstungen von Werkzeugmaschinen für Allgemeine Verwendung* (Electrical Machine Tool Equipment for General Use). In addition, the Swiss enforce special regulations with respect to the colors to be used for different cables. These regulations are published under the title *Farbenkennzeichen*. Both booklets may be obtained from the Swiss Electrotechnical Society. The name in German and its address are as follows: Schweizerischer Elektrotechnischer Verein, Seefeldstrasse 301, 8008 Zurich. U.S. standards applicable to the electrical parts of machine tools are not accepted in Switzerland.

Some of the larger Swiss end-users of machine tools have evolved their own norms for both the electrical and mechanical parts of machine tools based on the general standards. The standards are published in each company's "Technische Lieferbedingungen" (technical delivery conditions) and are

available to bidders on request. In addition, published national standards for metalworking and finishing equipment in Switzerland may be obtained through the American National Standards Institute Inc., 1430 Broadway, New York, New York 10018.

No performance standards are imposed on imported or locally produced metalworking and finishing equipment. However, machines must satisfy the conditions of the Swiss labor safety regulations which are issued and supervised by the Swiss Accident and Casualty Insurance Fund (SUVA) in Lucerne. Since U.S. industrial safety standards are at least as high as those imposed in Switzerland, U.S. equipment is completely acceptable. There are no special marking and labeling requirements for machine tools.

The electrical power characteristics for industrial use in Switzerland are 380 volts, A.C., 50 cycles, 3-phase.

The metric system is used exclusively for weight, dimension, and temperature.

The study on which this Country Market Brief is based is "The Market for Metalworking and Finishing Equipment in Switzerland," DIB 74-10-515.

U.S. Government Services Available To American Exporters

Export Information and Overseas Business Opportunities Services

The U.S. Department of Commerce, the largest source of export marketing information for U.S. industry, provides a wide range of information services designed to assist U.S. firms to develop and expand their export markets and overseas business activities. Recently modernized handling and retrieval techniques now make these services available in a fraction of the time that was previously necessary.

Export Information Services

The export information services described below can be obtained by contacting the U.S. Department of Commerce, Office of Export Development, Export Information Division, Room 1033, Washington, D.C. 20230, or the nearest of the Department's 42 district offices.

World Traders Data Reports

World Traders Data Reports (WTDR's) provide descriptive background information on specific foreign firms. Prepared by the U.S. Foreign Service, the WTDR's include such information as year of establishment, method of operation, lines handled, size of sales territory, name of chief executive, general reputation in trade and financial circles, names and addresses of credit sources, names of the firm's connections, and other commercial information. The complete name, street and city address of the foreign firm must be given when requesting this service. The price is \$15 per report.

Agent/Distributor Service

The Agent/Distributor Services (ADS) is designed for the businessman who needs assistance in identifying potential foreign agents or distributors. The information, which is provided by the U.S. Foreign Service, consists of up to three names of such prospects. Up to 30 days are required from date of receipt to complete the request. The charge for this service is \$25.

Export Mailing List Service

The Export Mailing List Service (EMLS) provides lists of foreign firms considered suitable for export contact purposes. Firms are drawn from the automated Foreign Traders Index. Their names and addresses are available on gummed mailing labels or in standard printout form. Printouts also include: Name and title of an officer, type of organization, year of establishment, relative size, number of employees and salespersons, and product and/or service

codes (Standard Industrial Classification numbers). A basic "set-up" payment of \$15, applicable to each retrieval, must accompany each request.

This charge covers payment for up to 300 printed names. An additional 5 cents is charged for each name above 300. Delivery can be made in about 15 days.

Foreign Traders Index (FTI) Data Tape Service

This service is offered as a convenience to firms that have a continuing need for a broad range of foreign commercial data, such as export management firms selling a wide range of products. This service provides, in magnetic tape form, information on all firms in one or more countries covered in the Foreign Traders Index. Users may thus retrieve various segments of FTI data by running tapes through their own computer facilities. The charge for this service is \$177 per country for up to 15 countries. The cost of the data for 15 or more countries or for the entire file is \$2,500.

Business Counseling Services

Business counseling services are provided both at the U.S. Department of Commerce in Washington and at the Department's 42 district offices. Visitors to Washington are served by the Business Counseling Section, which provides in-depth counseling and schedules appointments with appropriate officials within the Domestic and International Business Administration as well as with officials in other agencies.

Overseas Business Opportunities Services

The overseas business opportunities services described below can be obtained by contacting the U.S. Department of Commerce, Office of Export Development, Overseas Business Opportunities Division, Room 2323, Washington, D.C. or the nearest of the Department's 42 district offices.

Trade Opportunities Program

The Trade Opportunities Program (TOP) receives up-to-date trade leads from over 200 Foreign Service posts around the world daily and disseminates them to U.S. suppliers. Trade opportunities are based on inquiries by overseas companies who wish to purchase American products or services, or who are interested in representing U.S. firms. Trade opportunities may come from private commercial organizations, from foreign governments, or even from multinational organizations such as NATO or the UN.

To register for TOP, U.S. firms are requested to specify their product and country interests and the types of commercial information desired—direct sales, representation, and/or foreign government tenders. As leads are developed by the Foreign Service, they are cabled to Washington, where they are matched by computer against the criteria established by U.S. companies. These leads are then mailed to appropriate U.S. firms within a week of their origination overseas. Trade leads are charged against prepaid subscriptions, which are available for as little as \$25—for 50 leads; larger subscriptions are also available at \$50 and \$125.

Overseas Product Sales Group

The Overseas Product Sales Group (OPS) provides personalized assistance to TOP subscribers, or to firms identified as having high export capability, in bidding against foreign competitors for specific export sales opportunities with a value of \$1 million or more. The OPS specialists collect, inventory and disseminate

early information on export sales opportunities from TOP and a variety of other sources.

Foreign Investment Services Staff

The Foreign Investment Services Staff (FISS) is the focal point for American and foreign business inquiries relating to U.S. investment and licensing abroad. American businessmen are assisted in locating potential overseas licensees and partners, are provided with investment data on specific regions and countries, and are then guided toward sources of capital for these proposed projects. Foreign investment and licensing proposals for which U.S. participation and technology is sought are published regularly in *Commerce Today* and are brought to the direct attention of American firms where appropriate. In carrying out its broad range of activities, FISS works closely with other U.S. Government assistance sources, multinational agencies and private regional investment organizations.

FINANCING EXPORT SALES

The Export-Import Bank of the United States (Eximbank) is an independent agency of the U.S. Government which works directly with American suppliers and private financial institutions to finance U.S. export sales. Eximbank has numerous financing programs to assist U.S. firms. These include direct loans, bank guarantees, discount loans to commercial banks, leasing guarantees, and other programs to cover overseas design and engineering studies.

Financing packages for major industrial projects and exports of high value products are normally supported under Participation Financing, a combination of the Direct Loan and Financial Guarantee programs.

Direct Loans are dollar credits extended by Eximbank to borrowers outside the United States for purchases of U.S. goods and services. Disbursements under the loan agreement are made in the United States to the suppliers of the goods and services, and the loans, plus interest, are repaid in dollars by the borrowers.

Eximbank will extend its Financial Guarantee to cover loans made by U.S. financial institutions to foreign government or private purchasers of U.S. goods and services. The Financial Guarantee will unconditionally guarantee repayment by a borrower of up to 100% of the outstanding principal due on such loans plus interest equal to the U.S. Treasury rate for similar maturities, plus 1% per annum on the outstanding balances of the loan. Comparable guarantees are available to non-U.S. financial institutions under somewhat different terms.

Of particular importance to U.S. businessmen is Eximbank's Cooperative Financing Facility program which supports medium-term financing in all major markets. Eligible overseas banks are extended a line of credit for half the funds needed for each transaction, presently at 8% interest, and the cooperating banks provide the other half at local market rates. These banks make credit judgments regarding the

customer and can consummate transactions with a minimum of difficulty. Eximbank currently has established approximately 300 such working arrangements with foreign financial institutions (private and public) in over 100 countries.

Eximbank's Commercial Bank Exporter Guarantee program, another activity of special interest to exporters, provides guarantees covering the credit and political risks of non-payment of medium-term (181 days to 5 years) export debt obligations purchased by U.S. banking institutions on a non-recourse basis from the exporters. The fee charged for Eximbank's guarantee depends upon (1) the classification accorded the country of import, (2) the length of the repayment terms, and (3) the financial condition of the overseas buyer.

As a general rule, all transactions supported by Eximbank must include a minimum 10% cash payment by the buyer and must have reasonable assurance of repayment.

The Bank is directed by statute to supplement and encourage private capital, not compete with it. Selected product lines and services to designated markets are excluded from the agency's support; however, the overwhelming majority of U.S. export products and markets are covered. Details on the exceptions are available from U.S. commercial banks or directly from Eximbank.

Businessmen are specifically invited to utilize Eximbank's counseling services for exporters, banks and financial institutions seeking financing for U.S. exports. The services include information on the availability of financing within the United States and abroad, as well as on each of the pertinent Eximbank programs.

For additional information, contact the Export-Import Bank of the United States, 811 Vermont Avenue, N.W., Washington, D. C., 20571, or Telex 89-461.

EXPORT CREDIT INSURANCE

The Foreign Credit Insurance Association (FCIA) is an association of 50 stock and mutual insurance companies in partnership with the Export-Import Bank of the United States. It offers a comprehensive selection of credit insurance policies which protect policy holders against loss from failure to receive payment from foreign buyers.

The benefits of this coverage may be summed up as follows:

- It protects the exporter against the failure of the buyer to pay his dollar obligation for commercial or political reasons.
- It enables the exporter to offer foreign buyers competitive terms of payment.
- It supports the exporter's prudent penetration of higher risk foreign markets.
- It gives the exporter greater financial liquidity and flexibility in administering his foreign receivables portfolio.

Who May Be Insured

Virtually any corporation, partnership or individual doing business in the United States is eligible for FCIA coverage. An exporter may apply for a policy for himself or may become insured under the blanket policy of a bank or other financial institution which holds an FCIA policy.

Eligible Products

Foreign sales of all types of industrial, agricultural, and commercial products produced in the United States and of services rendered by U.S.-based personnel are eligible for FCIA insurance.

What Losses Are Covered

Comprehensive FCIA policies protect insureds against non-payment of receivables due to unforeseeable commercial and political occurrences. Commercial risks which are covered include insolvency of the buyer or protracted defaults which may well arise from economic deterioration in the buyer's market area, shifts in demands, unanticipated competition, tariffs, or technological changes. Also covered are defaults due to such buyer problems as increasing expenses, the loss of key personnel, and natural disasters.

Political risks coverage applies to defaults due to governmental action and to political disturbances such as war, revolution, and insurrection. Such events may result in confiscation of the buyer's assets, detention or diversion of shipments, or cancellation of necessary licenses by the United States or by the buyer's country. Also covered is the inability or refusal of the

foreign central bank involved to convert the buyer's currency to dollars. Political coverage alone is available for exporters who desire to assume their own commercial risks.

The Policies

The policies offered by FCIA are many and varied. They can be tailored to suit the needs of the individual exporters, service groups, and financial institutions. Aside from a small application fee, all premiums are paid only for goods actually shipped.

The Master Policy combines a deductible provision, discretionary credit authority, and once-a-year reporting to provide qualified exporters with lower premiums, independent credit decisions, faster services to overseas buyers, and less paperwork. It is a blanket policy which requires the exporter to insure all or a reasonable spread of his exportation.

The Short-Term Policy is a blanket policy which covers sales on terms of up to 180 days. It provides coverage of 90% for commercial losses and 95% for political losses. A moderate discretionary credit limit is included for each buyer.

The Medium-Term Policy provides 90% coverage (political and commercial) for capital and quasi-capital goods sold on terms of 181 days to 5 years. The policy is written on a case-by-case basis so an exporter need not insure all his medium-term transactions as he would under a blanket policy.

The Combination Policy provides short- and medium-term insurance to protect U.S. exporters in transactions with overseas dealers and distributors. It includes flexible coverage for short-term sales and for both inventory and receivable financing.

The Global End-User Policy allows exporters to insure the sales of capital goods to end-users through overseas distributors, dealers, and subsidiaries. This program permits title of capital goods to be transferred from the dealer to the end-user and still be eligible for coverage ("on-going sale").

The Comprehensive Services Policy insures the receivables generated by the performance of services for foreign customers by U.S.-based personnel, or by U.S. personnel temporarily assigned overseas. Industries benefiting from this coverage include management consultants, engineering and related construction consulting services, and transportation companies.

Special Policies: The FCIA also provides specially adapted policies for new exporters (the *Small Business Policy*) and for exhibitors in Department of Commerce Trade Shows (the *Exhibitors Policy*).

Special Coverage Endorsements are available in addition to the above policies. These include endorsements to cover specified preshipment risks and consignment selling.

An Aid to Financing

FCIA does not finance export sales. However, the exporter who insures his accounts receivable against commercial and political risks is usually able to obtain financing from commercial banks and other lending institutions at lower rates and on more liberal terms than would otherwise be possible.

Prequalification of Buyers

FCIA's rapidly expanding prequalifying (P.Q.) program is now providing credit information on more than 25,000 overseas buyers through its computerization data system. All the exporter needs to do is telephone the nearest FCIA office to determine whether a particular buyer is prequalified for the amount of his purchase.

Information about FCIA

More information about FCIA's services, and applications for policies, may be obtained through insurance agents or brokers or through FCIA's network of full-service regional offices. General questions and specific inquiries may be directed toward

the FCIA Ombudsman in the New York office. Call (212) 432-6216 for a direct connection.

FCIA Offices

One World Trade Center—9th Floor
New York, New York 10048
Phone: (212) 432-6200

Suite 1003—William-Oliver Bldg.
32 Peachtree Street, N.W.
Atlanta, Georgia 30303

Suite 1552
10 South Riverside Plaza
Chicago, Illinois 60606

Suite 1435
55 Public Square
Cleveland, Ohio 44113

611 West Sixth Street
Suite 650
Los Angeles, California 90017

700 North Water Street
Suite 1110—First Federal Bldg.
Milwaukee, Wisconsin 53202

1006 Main Street
C & I Bldg.—Suite 1408
Houston, Texas 77002

1 Embarcadero Center
Suite 2212
San Francisco, California 94111

Woodward Bldg., Suite 539
15th & H Streets, N.W.
Washington, D.C. 20005

TAX DEFERRAL BENEFIT PROGRAM FOR U.S. EXPORTERS (DISC)

Exporters will want to become familiar with the provisions of the Revenue Act of 1971 (Public Law 92-178) which permit U.S. firms to establish Domestic International Sales Corporations (DISC's) entitled to a tax break on export income. Essentially, the DISC is a domestic corporation which meets certain minimal organizational requirements and limits itself almost exclusively to export sales activities. If the corporation derives at least 95% of its income from export sales, lease, or rental transactions, and 95% of its assets are export related, it can defer U.S. income tax on up to 50% of its export income. Tax-deferred retained earnings can be used to expand and promote the DISC's export business and may also be loaned to any domestic producer of export goods, including the DISC's parent company.

DISC's can be formed by manufacturers, non-manufacturers, and export groups. A DISC can function as a principal, buying and selling for its own account, or as a commission agent. It can be related

to a manufacturing parent or can be an independent merchant or broker. Special intercompany pricing rules or transactions between a DISC and a related supplier or manufacturer allow a larger profit to the DISC than would normally be the case under the usual arm's-length pricing requirements of the Tax Code.

A corporation wishing to be tested as a DISC must file a statement of election (IRS Form 4876) with the Internal Revenue Service within 90 days preceding the beginning of its tax year, for a corporation already in existence, or within 90 days after the date of incorporation, if newly formed.

The rules for organizing and operating a DISC are comparatively simple. Many U.S. businesses, both large and small, should be able to avail themselves of the advantages of exporting through DISC's.

For further information contact the U.S. Department of Commerce, Office of International Finance and Investment, Foreign Business Practices Division, Washington, D.C. 20230, or phone (202) 967-4471.

DEPARTMENT OF COMMERCE CONTACTS FOR U.S. BUSINESS

Office of Field Operations

The 42 U.S. Department of Commerce district offices listed below represent the Department in their respective localities and assist in carrying out the

programs of the Department. Under the direction of the Office of Field Operations, these district offices are staffed by experienced specialists prepared to help in the solution of business problems and to assist in exporting.

ALBUQUERQUE, NEW MEXICO 87101
U.S. Courthouse—Room 316
Area Code 505 Tel. 766-2386

ANCHORAGE, ALASKA 99501
412 Hill Building
632 Sixth Avenue
Area Code 907 Tel. 265-4597/8

ATLANTA, GEORGIA 30309
Suite 523, 1401 Peachtree St., N.W.
Area Code 404 Tel. 325-3560

BALTIMORE, MARYLAND 21202
415 U.S. Customhouse
Gay and Lombard Streets
Area Code 301 Tel. 962-2560

BIRMINGHAM, ALABAMA 35205
Suite 200-201
908 South 20th Street
Area Code 205 Tel. 223-3327

BOSTON, MASSACHUSETTS 02116
10th Floor, 441 Stuart Street
Area Code 617 Tel. 223-2312

BUFFALO, NEW YORK 14202
910 Federal Building
111 West Huron Street
Area Code 716 Tel. 842-3208

CHARLESTON, WEST VIRGINIA 25301
3000 New Federal Office Building
500 Quarrier Street
Area Code 304 Tel. 343-6181, Ext. 375

CHEYENNE, WYOMING 82001
6022 O'Mahoney Federal Center
2120 Capitol Avenue
Area Code 307 Tel. 778-2220, Ext. 2151

CHICAGO, ILLINOIS 60603
Room 1406
Mid-Continental Plaza Bldg.
55 E. Monroe Street
Area Code 312 Tel. 353-4450

CINCINNATI, OHIO 45202
8028 Federal Office Building
550 Main Street
Area Code 513 Tel. 684-2944

CLEVELAND, OHIO 44114
Room 500, 666 Euclid Avenue
Area Code 216 Tel. 522-4750

COLUMBIA, SOUTH CAROLINA 29204
Forest Center
2611 Forest Drive
Area Code 803 Tel. 765-5345

DALLAS, TEXAS 75202
Room 3E7, 1100 Commerce Street
Area Code 214 Tel. 749-1515

DENVER, COLORADO 80202
Room 161, New Customhouse
19th and Stout Streets
Area Code 303 Tel. 837-3246

DES MOINES, IOWA 50309
609 Federal Building
210 Walnut Street
Area Code 515 Tel. 284-4222

DETROIT, MICHIGAN 48226
445 Federal Building
Area Code 313 Tel. 226-3650

GREENSBORO, NORTH CAROLINA 27402
203 Federal Building
West Market Street, P.O. Box 1950
Area Code 919 Tel. 275-9111, Ext. 345

HARTFORD, CONNECTICUT 06103
Room 610-B, Federal Office Building
450 Main Street
Area Code 203 Tel. 244-3530

HONOLULU, HAWAII 96813
286 Alexander Young Building
1015 Bishop Street
Area Code 808 Tel. 546-8694

HOUSTON, TEXAS 77002
1017 Federal Office Building
201 Fannin
Area Code 913 Tel. 226-4231

KANSAS CITY, MISSOURI 64106
Room 1840, 601 East 12th Street
Area Code 816 Tel. 374-3142

LOS ANGELES, CALIFORNIA 90024
11201 Federal Building
11000 Wilshire Blvd.
Area Code 213 Tel. 824-7591

MEMPHIS, TENNESSEE 38103
Room 710, 147 Jefferson Avenue
Area Code 901, Tel. 534-3214/5

MIAMI, FLORIDA 33130
Room 821, City National Bank Building
Area Code 305 Tel. 350-5267

MILWAUKEE, WISCONSIN 53203
Straus Building
238 West Wisconsin Avenue
Area Code 414 Tel. 224-3473

MINNEAPOLIS, MINNESOTA 55401
306 Federal Building
110 South Fourth Street
Area Code 612 Tel. 725-2133

NEWARK, NEW JERSEY 07102
Gateway Building (4th Floor)
Area Code 201 Tel. 645-6214

NEW ORLEANS, LOUISIANA 70130
909 Federal Office Building, South
610 South Street
Area Code 504 Tel. 527-6546

NEW YORK, NEW YORK 10007
41st Floor, Federal Office Building
26 Federal Plaza, Foley Square
Area Code 212 Tel. 264-0634

PHILADELPHIA, PENNSYLVANIA 19105
10112 Federal Building
600 Arch Street
Area Code 215 Tel. 597-2850

PHOENIX, ARIZONA 85004
508 Greater Arizona Savings Bldg.
112 North Central Ave.
Area Code 602 Tel. 261-3285

PITTSBURGH, PENNSYLVANIA 15222
431 Federal Building
1000 Liberty Avenue
Area Code 412 Tel. 644-2850

PORTLAND, OREGON 97205
Suite 501, Pittcock Block
921 S.W. Washington Street
Area Code 503 Tel. 221-3001

RENO, NEVADA 89502
2028 Federal Building
300 Booth Street
Area Code 702 Tel. 784-5203

RICHMOND, VIRGINIA 23240
8010 Federal Building
400 North 8th Street
Area Code 703 Tel. 782-2246

ST. LOUIS, MISSOURI 63103
2511 Federal Building
1520 Market Street
Area Code 314 Tel. 622-4243

SALT LAKE CITY, UTAH 84138
1203 Federal Building
125 South State Street
Area Code 801 Tel. 524-5116

SAN FRANCISCO, CALIFORNIA 94102
Federal Building, Box 36013
450 Golden Gate Avenue
Area Code 415 Tel. 556-5860

SAN JUAN, PUERTO RICO 00902
Room 100, Post Office Building
Phone: 723-4640

SAVANNAH, GEORGIA 31402
235 U.S. Courthouse & Post Office Building
125-29 Bull Street
Area Code 912 Tel. 232-4321, Ext. 204

SEATTLE, WASHINGTON 98109
Room 706, Lake Union Bldg.
Area Code 206 Tel. 442-5615

U.S. Trade Promotion Facilities Abroad

U.S. Trade Promotion Facilities Abroad provide U.S. manufacturers with a unique method of testing and selling in key foreign markets through commercial showrooms established in central marketing areas where the potential for American products is continuous. The Trade Development Office in Warsaw, however, does not have exhibit facilities.

AUSTRALIA

37 Pitt Street
Sydney NSW 2000

AUSTRIA

Prinz Eugen Strasse 8-10
A-1040
Vienna

FRANCE

123 Avenue Charles de Gaulle
92200 Neuilly
Paris

GERMANY

Bockenheimer Landstrasse 2-4
D-6000 Frankfurt/Main

IRAN

Queen Elizabeth II Boulevard
and Kh. Attarzadeh
Tehran

ITALY

Via Gattamelata 5
20149 Milan

JAPAN

Tameike Tokyu Building
1-14 Akasaka, 1-Chome
Minato-Ku
Tokyo 107

JAPAN

American Merchandise
Display Osaka
Sankei Kaikan Building
27, Umeda-Cho, Kita-Ku
Osaka

KOREA

American Embassy
82 Sejon-Ro
Seoul

Information on exhibitions at U.S. Trade Promotion Facilities Abroad may be obtained from the U.S. Department of Commerce, Bureau of International Commerce, Office of International Marketing, Washington, D.C. 20230, or the nearest of the Department's 42 district offices.

Listed below are the 17 U.S. Trade Promotion facilities located in major cities in Europe, Asia, Australia and Latin America.

LEBANON

American Embassy
Ali Reza Building
Corniche at Avenue de Paris
Beirut

MEXICO

Liverpool No. 31
Mexico 6, D.F.

POLAND

U.S. Trade Development and
Technical Information Office
Ulica Wiejska 20
Warsaw

SINGAPORE

268 Orchard Road
Yen San Building
Singapore 9

SWEDEN

Vasagatan 11
Stockholm

TAIWAN

Nanking East Road
Taiwan Glass Co. Bldg.
Taipei

UNITED KINGDOM

4/5 Langham Place
London W1

U.S.S.R.

The Moscow Commercial Office
c/o American Embassy
Department of State
Washington, D.C. 20520

Office of Export Administration

Information on U.S. Export Controls may be obtained from the U.S. Department of Commerce, Bureau of East-West Trade, Office of Export Administration, Washington, D.C. 20230. Telephone: (202) 967-4811.

Schedule of Trade Promotional Events

Metalworking and Finishing Equipment

The schedule of promotional events for 1975 and 1976 lists appropriate activities for promoting sales of metalworking and finishing equipment in the 22 foreign countries covered in this Survey.

The Schedule provides a chronological listing, by country, covering the following types of promotional activities:

- **International Trade Fairs**—Privately sponsored, foreign managed international exhibitions in which U.S. firms may exhibit their products on an individual basis.
- **Conferences, Congresses, Seminars and Symposia**—Privately sponsored, international activities in which U.S. firms may participate on an individual basis. Some of these events are held in conjunction with international trade fairs; others are held independently.
- **U.S. Trade Promotion Facilities Abroad**—These provide year-round facilities for display and demonstration of U.S. products.

Some of these promotional events feature metalworking and finishing equipment while others are oriented primarily to a specific end-user industry. The information for scheduled events was obtained from market surveys and the U.S. Foreign Service. Some events may be subject to change without notice but at the time of publication were scheduled for the dates and locations shown.

Events sponsored by or participated in by the U.S. Department of Commerce appear in boldface letters on the Schedule.

Additional Commerce-sponsored promotional activities may be scheduled from time to time. These include:

- **Specialized Product Shows** and other marketing activities are held in permanent facilities situated in major business centers. U.S. Trade Promotion Facilities are located in Beirut, Frankfurt, London, Mexico City, Milan, Moscow, Osaka, Paris, Seoul, Singapore, Stockholm, Sydney, Taipei, Tehran, Tokyo, and Vienna. A Trade Development Office is located in Warsaw.
- **"Between Show Promotions"**—During periods between major shows, individual U.S. firms, or their authorized representatives, are encouraged to use the above facilities to stage one-company product promotions or sales seminars.
- **Specialized U.S. Trade Missions**—The U.S. Department of Commerce organizes and sponsors Trade Missions covering selected product themes based on available market research and Foreign Service recommendations, establishes the overseas itinerary, pays the Mission's operating expenses, and provides an Advance Officer and Mission Director.

For further information regarding events sponsored by or participated in by the U.S. Department of Commerce, contact any one of the 42 Commerce district offices listed two pages back. Additional information on all other events may be obtained from the contact indicated in the Schedule of Events for the particular activity.

Schedule of Trade Promotional Events—1975-1976

EVENT	1975	1976
AUSTRALIA		
THE METAL TRADES ASSOCIATION OF AUSTRALIA (SEMINAR) Location: Exhibition Buildings, Melbourne, Victoria Sponsor: The Metal Trades Industry Assn., 105 Walker St., North Sydney, N.S.W. 2060 Frequency: Biennial	August	
INTERNATIONAL METALLIC CORROSION CONGRESS Location: Wentworth Hotel, Sydney, N.S.W. Sponsor: International Corrosion Assn., Total Concept Exhibitions Pty. Ltd, 57a Ethel St., Balgowlah, 2093, N.S.W. Frequency: Triennial	December	
METALWORKING EQUIPMENT EXHIBIT Location: U.S. Trade Center, Sydney Sponsor: U.S. Dept. of Commerce		February
INTERNATIONAL WELDING EXHIBITION Location: Sydney, N.S.W. Sponsor: Australian Welding Institute, 307 Pitt Street, Sydney, N.S.W. 2000 Frequency: Biennial		July or August
AUSTRALIA INTERNATIONAL ENGINEERING EXHIBITION (AIEE) Location: R.A.S. Showgrounds, Sydney, N.S.W. Sponsor: The Metal Trades Industry Assn. of Australia, 105 Walker St., N. Sydney, N.S.W. 2060 Frequency: Biennial		September
BRAZIL		
MACHINE TOOL TRADE FAIR Location: Sao Paulo Sponsor: Alcentral Machado Comercio e Empreendimentos Ltda, Rua Brasilio Machado, 60, Sao Paulo, S.P. Frequency: Proposed	November	
FRANCE		
WORLD MACHINE TOOL EXPOSITION 1975 Location: Paris Sponsor: Emo, 150 Blvd. Bineau, 92200 Neuilly Sur Seint	June	

EVENTS	1975	1976
BIENNIAL FRENCH MACHINE TOOL, WELDING AND INDUSTRIAL EQUIPMENT EXHIBITION Location: C.N.I.T. Exhibition Centre, Place de la Defense, Paris Sponsor: Biennial French Machine Tool Welding and Mechanical Equipment Exhibition, 20 Rue Carpeaux, 92806, Puteaux Frequency: Biennial		Date Not Set
METALWORKING AND FINISHING EQUIPMENT EXHIBITION Location: U.S. Trade Center, Paris Sponsor: U.S. Department of Commerce		May
INTERNATIONAL EXHIBITION "SURFACE TREATMENT AND INDUSTRIAL FINISHING" Location: Palais de la Defense (CNIT) 92 Sponsor: Compagnie Francaise d'Editions, Department Expositions, c/o Rue Du Colisee, 75 008, Paris Frequency: Biennial	May	
GERMANY		
INTERNATIONAL HARDWARE FAIR Location: Cologne Exhibition Grounds, Cologne Sponsor: Messe-Und Austellungen GmbH KOLN, P 5 KOLN 21, P.O. Box 210760 Frequency: Annual	February	February
TECHNICAL CONFERENCE ON SURFACE TREATMENT, DRIVES AND TRANSMISSIONS, ASSEMBLING AND HANDLING ENGINEERING, HANOVER FAIR (HANOVER MESSE) Location: Hanover Exhibition Grounds, Hanover Sponsor: Deutsche Messe-Und Ausstellungen, A.G., D.3000 Hanover, Messagelaende, 3 Hanover Frequency: Annual	April-May	April-May
INDIA		
MACHINE TOOL SHOW Location: Bombay Sponsor: Indian Machine Tool Builders Association, Bombay Frequency: Proposed	January/February	
IRAN		
GENERAL INDUSTRIAL EQUIPMENT COMMERCIAL FAIR Location: Tehran, Iran Sponsor: U.S. Department of Commerce	October	
ISRAEL		
TECHNOLOGY '75 INTERNATIONAL FAIR AND TECHNICAL SEMINARS Location: Exhibition Gardens, Tel Aviv Sponsor: Yerid Hamizrakh Exhibitions Co. Ltd, P.O. Box 21075, Tel Aviv Frequency: Biennial	May	

EVENTS	1975	1976
ITALY		
INDUSTRIAL ASSEMBLY EQUIPMENT EXHIBIT Location: U.S. Trade Center, Milan Sponsor: U.S. Department of Commerce	March	
INTERNATIONAL TECHNICAL EXHIBITION (Technical Meetings, Seminars & Symposia) Location: Corso Massimo d'Azeglio 15, Turin Sponsor: Torino Esposizioni Spa, Corso Massimo d'Azeglio 15, Turin, 10126 Frequency: Annual	September/ October	September/ October
METAL FINISHING AND SURFACE TREATMENT EQUIPMENT EXHIBIT Location: U.S. Trade Center, Milan Sponsor: U.S. Department of Commerce	December	
NUMERICAL CONTROLS CONFERENCE AND EXHIBITION Location: Milan Fairgrounds, Milan Sponsor: U.C. IMO, Viamonte Rosa 21, 20149, Milan Frequency: Biennial		March
ITALIAN MACHINE TOOL EXHIBITION Location: Quartiere Fiera Milano, Milan Sponsor: U.S. IMO, Viz Monte Rosa, 21, 20149, Milan Frequency: Biennial		October
JAPAN		
TOKYO INTERNATIONAL METALWORKING MACHINE EXHIBITION Location: Tokyo International Fairground, Tokyo Sponsor: Ministry of International Trade and Industry, Science and Technology Agency, and Japan Machine Tool Builders Association Frequency: Annual	Scheduled 1975	Scheduled 1976
LABOR SAVING MACHINERY EXHIBITION Location: Tokyo International Fairground, Tokyo Sponsor: Ministry of International Trade and Industry, 1-3 Kasumigaseki, Chiyoda-Ku, Tokyo 100, jointly with Japan Machine Tool Builders Association	Spring	
JAPAN INTERNATIONAL MACHINE TOOL FAIR Location: Tokyo or Osaka Sponsor: Ministry of International Trade and Industry jointly with Science and Technology Agency and Japan Machine Tool Builders Association Frequency: Biennial		Date Not Set
MEXICO		
METALLURGY AND METAL FINISHING EQUIPMENT EXHIBIT Location: U.S. Trade Center, Mexico City Sponsor: U.S. Department of Commerce	August	

EVENTS	1975	1976
PEOPLE'S REPUBLIC OF CHINA		
KWANGCHOW (CANTON) TRADE FAIR Location: Kwangchow (Canton), Kwangtong Sponsor: China Export Commodities Fair, Hai Chu Square, Kwangchow Frequency: Semi-annual	April-May October-November	April-May October-November
POLAND		
POZNAN TECHNICAL FAIR (GENERAL INDUSTRIAL EQUIPMENT) Location: Poznan, Poland Sponsor: The Poznan International Fair, Poznan 2, No. 102, Poland Frequency: Annual	June	June
NON-FERROUS METALS PROCESSING AND FABRICATION: TECHNICAL SALES SEMINAR Location: Warsaw Sponsor: Bureau of East-West Trade, U.S. Department of Commerce, Washington, D.C. 20230	December	
SPAIN		
INTERNATIONAL PRODUCTS FAIR Location: International Trade Fair, Bilbao Sponsor: Ministry of Commerce		June
SWEDEN		
NORD-METAL (METALWORKING AND FINISHING EQUIPMENT) Location: U.S. Trade Center, Stockholm Sponsor: U.S. Department of Commerce	October	
STOCKHOLM TECHNICAL FAIR Location: Stockholm Sponsor: AB St. Eriksmassan, Massvagen, 1 S-106 80, Stockholm Frequency: Annual	October	October
MEKANIK 76—INTERNATIONAL TRADE FAIR FOR THE MECHANICAL ENGINEERING INDUSTRY Location: Malmo Exhibition Halls, Malmo Sponsor: The Scania Trade Fair Foundation and Swedish Organization Of Engineering Workshops, Box 19015, 200 73 Malmo 19		March-April
REPUBLIC OF CHINA ON TAIWAN		
EQUIPMENT FOR THE METALWORKING INDUSTRIES EXHIBIT Location: U.S. Trade Center, Taipei Sponsor: U.S. Department of Commerce	April	
UNITED KINGDOM		
INTERNATIONAL WELDING & METAL FABRICATION EXHIBITION Location: Olympia, London Sponsor: Industrial Trade Fairs Lt., Commonwealth House, New Oxford Street, London WC1	April	

EVENTS	1975	1976
SPECIALIZED MACHINE TOOLS AND ACCESSORIES EXHIBIT Location: U.S. Trade Center, London Sponsor: U.S. Department of Commerce	October	
UNION OF SOVIET SOCIALIST REPUBLICS		
EQUIPMENT FOR ALUMINUM PRODUCTION AND MANUFACTURING OF ALUMINUM SEMIPRODUCTS Location: Moscow Sponsor: Department of International and Foreign Exhibitions in the USSR, 1 (A) Sokolnichesky Val, Moscow 107232	July	
ADVANCED METALLURGICAL PRODUCTION SYSTEMS Location: Moscow Sponsor: U.S. Commercial Office, Moscow	September	
NON-FERROUS METALS PROCESSING AND FABRICATION: TECHNICAL SALES SEMINAR Location: Moscow Sponsor: Bureau of East-West Trade, U.S. Department of Commerce, Washington, D.C. 20230	December	







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